OMRON

E5AZ
E5EZ

Digital Temperature Controller

User's Manual

Cat. No. H205-E1-01

E5AZ/E5EZ Digital Temperature Controller

User's Manual

Produced September 2007

Preface

The compact E5AZ/E5EZ Temperature Controller allows the user to carry out the following:

- Depth of only 78 mm.
- Select from many types of temperature, infrared temperature sensor and analog input
- Select heating/cooling control in addition to standard control
- Select AT (auto-tuning) and ST (self-tuning) as tuning functions
- Use multi-SP and the run/stop function according to event input
- Use optional functions when option board E53-AZM is mounted along with option units.
- Use the HBA (heater burnout alarm) function (when option unit E53-AZH is fitted)
- Use the communications function (when option communications unit E53-AZ01 or E53-AZ03 is fitted)
- The E5AZ/E5EZ conforms to UL/CSA/IEC safety standards and EMC standards.

This User's Manual describes how to use the E5AZ/E5EZ.
Before using your E5AZ/E5EZ, thoroughly read and understand this manual in order to ensure correct use.
Also, store this manual in a safe place so that it can be retrieved whenever necessary.

Note For an additional description of the communications function, also refer to the *E5AZ/E5EZ/E5EZ-PRR/E5CZ Digital Temperature Controllers Communications User's Manual* (Cat. No. H204).

Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

Note Indicates information of particular interest for efficient and convenient operation of the product.

1,2,3... 1. Indicates lists of one sort or another, such as procedures, checklists, etc.

Read and Understand this Manual

Please read and understand this manual before using the product. Please consult your OMRON representative if you have any questions or comments.

Warranty and Limitations of Liability

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

Application Considerations

SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this manual.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

Disclaimers

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

PERFORMANCE DATA

Performance data given in this manual is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

ERRORS AND OMISSIONS

The information in this document has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

Safety Precautions

■ Definition of Precautionary Information

The following notation is used in this manual to provide precautions required to ensure safe usage of the product.

The safety precautions that are provided are extremely important to safety. Always read and heed the information provided in all safety precautions.

The following notation is used.

⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, is likely to result in minor or moderate injury or in property damage.

■ Symbols

Symbol		Meaning
Caution		**General Caution** Indicates non-specific general cautions, warnings, and dangers.
		**Electrical Shock Caution** Indicates possibility of electric shock under specific conditions.
Prohibition		**General Prohibition** Indicates non-specific general prohibitions.
Mandatory Caution		**General Caution** Indicates non-specific general cautions, warnings, and dangers.

■ Safety Precautions

⚠ CAUTION	
If the output relays are used past their life expectancy, contact fusing or burning may occasionally occur. Always consider the application conditions and use the output relays within their rated load and electrical life expectancy. The life expectancy of output relays varies considerably with the output load and switching conditions.	
CAUTION - Risk of Fire and Electric Shock a) This product is UL listed as Open Type Process Control Equipment. It must be mounted in an enclosure that does not allow fire to escape externally. b) More than one disconnect switch may be required to de-energize the equipment before servicing the product. c) Signal inputs are SELV, limited energy. (See note 1.) d) Caution: To reduce the risk of fire or electric shock, do not interconnect the outputs of different Class 2 circuits. (See note 2.)	
Do not touch the terminals while power is being supplied. Doing so may occasionally result in minor injury due to electric shock.	
Be sure to turn OFF the power supply before mounting the option unit. Not doing so may occasionally result in minor or moderate injury due to electric shock.	
Do not allow pieces of metal, wire clippings, or fine metallic shavings or filings from installation to enter the product. Doing so may occasionally result in electric shock, fire, or malfunction.	
Do not use the product where subject to flammable or explosive gas. Otherwise, minor injury from explosion may occasionally occur.	
Never disassemble, modify, or repair the product or touch any of the internal parts. Minor electric shock, fire, or malfunction may occasionally occur.	

Note

1. A SELV circuit is one separated from the power supply with double insulation or reinforced insulation, that does not exceed 30 V r.m.s. and 42.4 V peak or 60 VDC.
2. A class 2 power supply is one tested and certified by UL as having the current and voltage of the secondary output restricted to specific levels.

⚠ CAUTION	
Loose screws may occasionally result in fire. Tighten terminal screws to the specified torque of 0.74 to 0.90 N·m.	
Unexpected operation may result in equipment damage or accidents if the settings are not appropriate for the controlled system. Set the Temperature Controller as follows:	
A malfunction in the Temperature Controller may occasionally make control operations impossible or prevent alarm outputs, resulting in property damage. To maintain safety in the event of malfunction of the Temperature Controller, take appropriate safety measures, such as installing a monitoring device on a separate line.	
Be sure that the platinum resistance thermometer type and the input type set on the Temperature Controller are the same.	

Precautions for Safe Use

Be sure to observe the following precautions to ensure the safe use of the product.

1. Do not use the product in any of the following environments.
   - Places subject to splashing liquid or oil atmosphere
   - Places subject to direct sunlight
   - Places subject to dust or corrosive gas (in particular, sulfide gas and ammonia gas)
   - Places subject to intense temperature change
   - Places subject to icing and condensation
   - Places subject to vibration and large shocks
   - Places directly subject to heat radiated from heating equipment.
2. To reduce the risk of fire or electric shock, install the Temperature Controller in a controlled environment relatively free of contaminants.
3. Use and store the product within the rated temperature and humidity ranges. Group-mounting two or more Temperature Controllers, or mounting Temperature Controllers above each other may cause heat to build up inside the Temperature Controllers, which will shorten their service life. In such a case, use forced cooling by fans or other means of air ventilation to cool down the Temperature Controllers.
4. To allow heat to escape, do not block the area around the product. Do not block the ventilation holes on the product.
5. Use the specified size (M3.5, width of 7.2 mm or less) crimped terminals for wiring.
6. To connect bare wires to the terminal block, use copper braided or solid wires with a gage of AWG24 to AWG14 (equal to a cross-sectional area of 0.205 to 2.081 mm^2). (The stripping length is 5 to 6 mm.) Up to two wires of the same size and type, or two crimp terminals can be inserted into a single terminal.
7. Be sure to wire properly with correct polarity of terminals. Do not wire any of the I/O terminals incorrectly.
8. Do not wire the terminals that are not used.
9. The voltage output (control output) is not electrically isolated from the internal circuits. When using a grounded temperature sensor, do not connect any of the control output terminals to ground.Otherwise unwanted current paths will cause measurement errors.
10. To avoid inductive noise, keep the wiring for the Temperature Controller's terminal block away from power cables carrying high voltages or large currents. Also, do not wire power lines together with or parallel to Temperature Controller wiring. Using shielded cables and using separate conduits or ducts is recommended. Attach a surge suppressor or noise filter to peripheral devices that generate noise (in particular, motors, transformers, solenoids, magnetic coils or other equipment that have an inductance component). When a noise filter is used at the power supply, first check the voltage or current, and attach the noise filter as close as possible to the temperature controller. Allow as much space as possible between the Temperature Controller and devices that generate powerful high frequencies (high-frequency welders, high-frequency sewing machines, etc.) or surge.
11. Use the product within the rated load and power supply.

12. Use a switch, relay, or other contact so that the power supply voltage reaches the rated voltage within 2 seconds. If the applied voltage is increased gradually, the power supply may not be reset or malfunctions may occur.
13. When using PID operation (self-tuning), turn ON the power supply to the load (e.g., heater) at the same time or before turning the power supply to the Temperature Controller ON. If power is turned ON for the Temperature Controller before turning ON power supply to the load, self-tuning will not be performed properly and optimum control will not be achieved.
14. Design the system (e.g., control panel) to allow for the 2 seconds of delay required for the Temperature Controller's output to stabilize after the power is turned ON.
15. A switch or circuit breaker should be provided close to this unit. The switch or circuit breaker should be within easy reach of the operator, and must be marked as a disconnecting means for this unit.
16. Approximately 30 minutes is required for the correct temperature to be displayed after turning the power supply to the Temperature Controller ON. Turn the power supply ON at least 30 minutes prior to starting control operations.
17. The output may turn OFF when shifting to certain levels. Take this into consideration when performing control.
18. When turning OFF the power, use a switch or relay to ensure the voltage decreases immediately. Incorrect operation and data storage errors may occur if the voltage decreases slowly.
19. When extending the thermocouple lead wires, always use compensating conductors suitable for the type of thermocouple. Do not extend the lead wires on a platinum resistance thermometer. Use only low-resistance wire (5 Ω max. per line) for lead wires and make sure that the resistance is the same for all three wires.
20. Make sure that any option units are installed correctly. Do not remove the internal PCB when installing an option unit.
21. When drawing out the Temperature Controller from the case, do not apply force that would deform or alter the Temperature Controller.
22. When drawing out the Temperature Controller from the case to replace the Temperature Controller, check the status of the terminals. If corroded terminals are used, contact faults with the terminals may cause the temperature inside the Temperature Controller to increase, possibly resulting in fire. If the terminals are corroded, replace the rear case as well.
23. When inserting the Temperature Controller into the case, do not force it into the case. Doing so will damage internal parts.
24. When drawing out the Temperature Controller from the case, turn the power supply OFF first, and absolutely do not touch the terminals or electronic components or apply shock to them. When inserting the Temperature Controller, do not allow the electronic components to come into contact with the case.
25. Static electricity may damage internal components. Always touch grounded metal to discharge any static electricity before handling the Temperature Controller. When drawing out the Temperature Controller from the case, do not touch the electronic components or patterns on the board with

your hand. Hold the Temperature Controller by the edge of the front panel when handling it.

26. The EEPROM has a limited write life. When overwriting data frequently, e.g., via communications, use RAM Mode.
27. Do not use paint thinner or similar chemical to clean with. Use standard grade alcohol.
28. Use tools when separating parts for disposal. Contact with the sharp internal parts may cause injury.

Precautions for Correct Use

Service Life

1. Use the product within the following temperature and humidity ranges:
   Temperature: –10 to 55°C (with no icing or condensation)
   Humidity: 25% to 85%
   If the product is installed inside a control board, the ambient temperature must be kept to under 55°C, including the temperature around the product.
2. The service life of electronic devices like Temperature Controllers is determined not only by the number of times the relay is switched but also by the service life of internal electronic components. Component service life is affected by the ambient temperature: the higher the temperature, the shorter the service life, and the lower the temperature, the longer the service life. Therefore, the service life can be extended by lowering the temperature of the Temperature Controller.
3. When two or more Temperature Controllers are mounted horizontally close to each other or vertically next to one another, the internal temperature will increase due to heat radiated by the Temperature Controllers and the service life will decrease. In such a case, use forced cooling by fans or other means of air ventilation to cool down the Temperature Controllers. When providing forced cooling, however, be careful not to cool down the terminals sections alone to avoid measurement errors.

Measurement Accuracy

1. When extending or connecting the thermocouple lead wire, be sure to use compensating wires that match the thermocouple types.
2. When extending or connecting the lead wire of the platinum resistance thermometer, be sure to use wires that have low resistance and keep the resistance of the three lead wires the same.
3. Mount the product so that it is horizontally level.
4. If the measurement accuracy is low, check to see if input shift has been set correctly.

Operating Precautions

1. It takes approximately two seconds for the outputs to turn ON from after the power supply is turned ON. Due consideration must be given to this time when incorporating Temperature Controllers in a sequence circuit.
2. When using self-tuning, turn ON power for the load (e.g., heater) at the same time as or before supplying power to the Temperature Controller. If power is turned ON for the Temperature Controller before turning ON power for the load, self-tuning will not be performed properly and optimum control will not be achieved.
3. When starting operation after the Temperature Controller has warmed up, turn OFF the power and then turn it ON again at the same time as turning ON power for the load. (Instead of turning the Temperature Controller OFF and ON again, switching from STOP mode to RUN mode can also be used.)
4. Avoid using the Controller in places near a radio, television set, or wireless installation. These devices can cause radio disturbances which adversely affect the performance of the Controller.

Related Manuals

The manuals related to the E5AZ/E5EZ are configured as shown in the following tables. Refer to these manuals as required.

Name	Cat. No.	Contents
E5AZ/E5EZ Digital Temperature Controller User's Manual	H205 (This manual)	Describes the following information on the E5AZ/E5EZ. • Overview and features • Basic specifications • System design • System configuration • Mounting and wiring • Maintenance
E5AZ/E5EZ/E5EZ-PRR/E5CZ Digital Temperature Controllers Communications User's Manual	H204	Describes the CompoWay/F and SYSWAY communications commands used with E5□Z Digital Temperature Controllers.

Conventions Used in This Manual

Model Notations

"E5AZ/E5EZ" is used when the information being provided applies to all E5□Z-□3□□ Digital Temperature Controllers. The notation used in the manual for information that is restricted by the model is given in the following table.

Notation	Optional function
E53-AZM	Option board is mounted along with one or two of the following option units.
E53-AZH	Heater burnout alarm option unit
E53-AZ01	RS-232C communications option unit
E53-AZ03	RS-485 communications option unit
E53-AZB	Event input option unit

Note The E5AZ/E5EZ provides optional functions when an E53-AZM option board is mounted along with one or two (E53-AZH and another) option units.

Meanings of Abbreviations

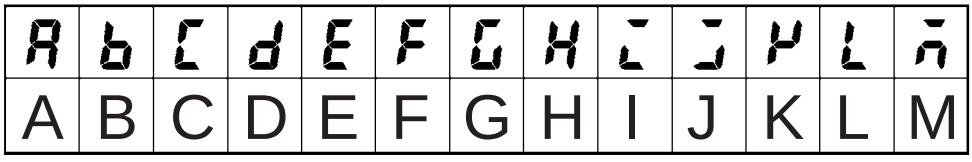
The following abbreviations are used in parameter names, figures and in text explanations. These abbreviations mean the following:

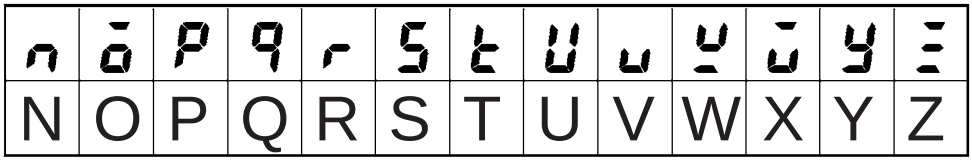
Symbol	Term
PV	Process value
SP	Set point
SV	Set value
AT	Auto-tuning
ST	Self-tuning
EU	Engineering unit (See note.)

Note "EU" stands for Engineering Unit. EU is used as the minimum unit for engineering units such as °C, m, and g.
The size of EU varies according to the input type. For example, when the input temperature setting range is –200 to +1300°C, 1 EU is 1°C, and when the input temperature setting range is –20.0 to +500.0°C, 1 EU is 0.1°C.
In the case of analog input, the size of EU varies according to the decimal point position of the scaling setting, and 1 EU becomes the minimum scaling unit.

How to Read Display Symbols

The following tables show the correspondence between the symbols displayed on the displays and alphabet characters.





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About this Manual:

Please read this manual carefully and be sure you understand the information provided before attempting to install or operate the E5AZ/E5EZ Temperature Controller. Be sure to read the precautions provided in the following section.

Section 1 describes the features, names of parts and typical functions.

Section 2 describes installation and wiring.

Section 3 describes basic control examples.

Section 4 describes advanced functions to fully use E5AZ/E5EZ.

Section 5 describes the parameters of the E5AZ/E5EZ.

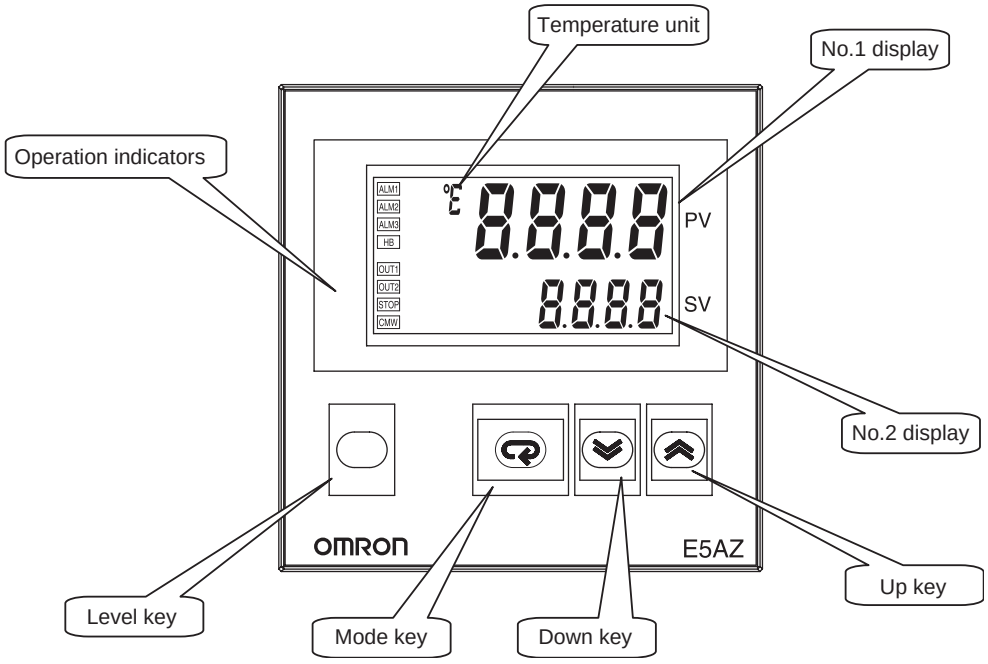
SECTION 1
Introduction

This section introduces the features, components, and main specifications of the E5AZ/E5EZ Digital Temperature Controllers.

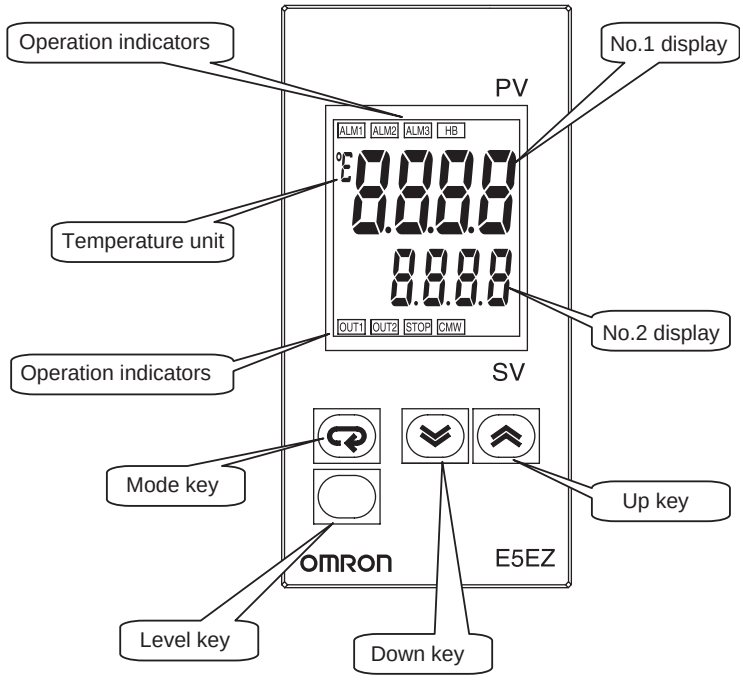
1-1 Names of Parts

1-1-1 Front Panel

E5AZ



E5EZ



1-1-2 Meaning of Indicators

No. 1 display Displays the process value or parameter type.

Lights for approximately one second during startup.

No. 2 display Displays the set point, parameter operation read value, or the variable input value.

Lights for approximately one second during startup.

Operation indicators

1. ALM1 (alarm 1)
   Lights when alarm 1 output is ON.
   ALM2 (alarm 2)
   Lights when alarm 2 output is ON.
   ALM3 (alarm 3)
   Lights when alarm 3 output is ON.
2. HB (heater burnout alarm display)
   Lights when a heater burnout is detected.
3. OUT1, OUT2 (control output 1, control output 2)
   Lights when control output 1 or control output 2 is ON.
   However, OUT1 is not lit whenever control output 1 is current output.
4. STOP (stop)
   Lights when operation is stopped.
   During operation, this indicator lights when operation is stopped by an event or by using the RUN/STOP function.
5. CMW (communications writing control)
   Lights when communications writing is enabled and is not lit when it is disabled.

Temperature unit

The temperature unit is displayed when parameters are set to display a temperature. The display is determined by the currently selected "temperature unit" parameter set value. C indicates °C and F indicates °F.

Flashes during ST operation.

1-1-3 Using the Keys

This section describes the basic functions of the front panel keys.

(level) key

Press this key to move between setting levels. The following setting levels can be selected: operation level, adjustment level, initial setting level, communications setting level.

(mode) key

Press this key to change parameters within a setting level.

(up) key

Each press of this key increments the value displayed on the No. 2 display or advances the setting. Holding the key down speeds up the incrementation.

(down) key

Each press of this key decrements values displayed on the No. 2 display or reverses the setting. Holding the key down speeds up the decrementation.

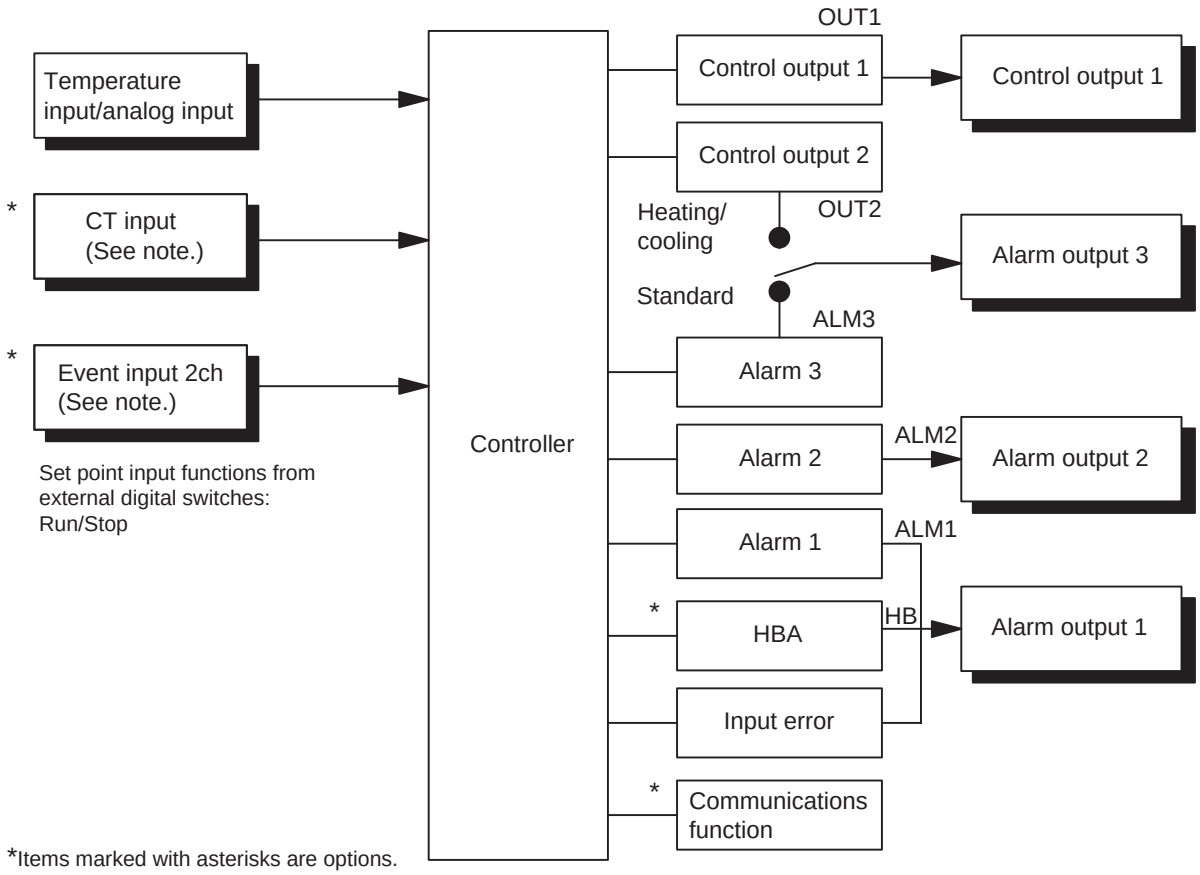
+ keys

These keys set the E5AZ/E5EZ to the "protect level". For details on the protect level, refer to *SECTION 5 Parameters*.

1-2 I/O Configuration and Main Functions

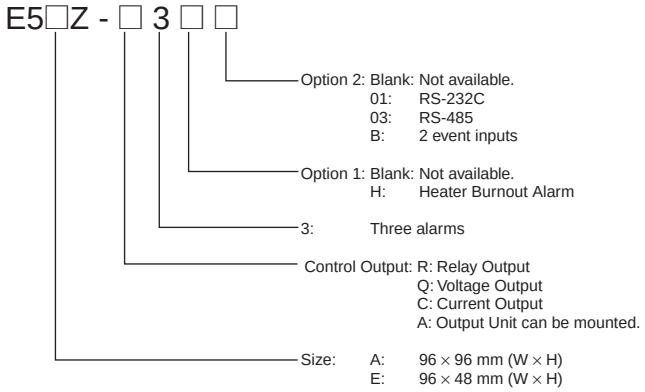
1-2-1 I/O Configuration

E5AZ/E5EZ



Note Functions can be assigned individually for each output by changing the set values for the control output 1 assignment, the control output 2 assignment, the alarm 1 assignment, the alarm 2 assignment, and the alarm 3 assignment in the advanced function setting level.

1-2-2 Basic Model



Note Options 1 and 2 are supported when using an E53-AZM Option Board.

1-2-3 Main Functions

This section introduces the main E5AZ/E5EZ functions. For details on particular functions and how to use them, refer to *SECTION 3 Basic Operation* and following sections.

Input Sensor Types

- The following input sensors can be connected for temperature input:

  Platinum resistance thermometer
  : Pt100, JPt100
  Thermocouple : K, J, T, E, L, U, N, R, S, B
  Infrared temperature sensor: ES1B
  :10 to 70°C, 60 to 120°C, 115 to 165°C, 140 to 260°C
  Analog input : 0 to 50 mV

Control Outputs

- A control output can be relay, voltage, or current output, depending on the model of E5AZ/E5EZ.
- With the E5□Z-□3□□, alarm output 3 is used as control output 2 (cooling) when heating/cooling control is selected. Therefore, use alarm 1 and 2 if an alarm is required while using heating/cooling control.

Alarms

- Alarms can be used with the E5□Z-□3□□. Set the alarm type and alarm value or the alarm value upper and lower limits.
- If necessary, a more comprehensive alarm function can be achieved by setting the standby sequence, alarm hysteresis, close in alarm/open in alarm, and alarm latch parameters.
- When the "input error output" parameter is set to ON, alarm output 1 turns ON when an input error occurs.

Control Adjustment

- Optimum PID constants can be set easily by performing AT (auto-tuning) or ST (self-tuning).

Event Inputs

- With the E53-AZB, the following functions can be executed using event inputs: switching set points (multi-SP, 4 pts. max.), and switching RUN/STOP status.

Heater Burnout Alarms (HBA)

- With the E53-AZH, the heater burnout detection alarm function can be used.

Communications Functions

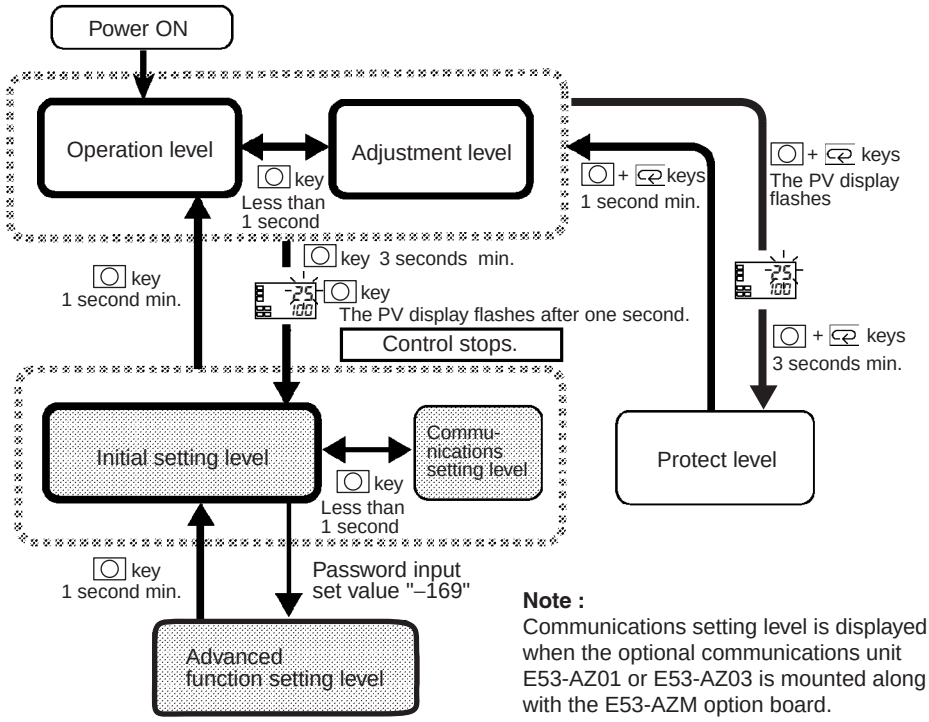
- With the E53-AZ01 or E53-AZ03, the communications functions utilizing CompoWay/F (See note 1.) or SYSWAY can be used.
  E5□Z-□3□03: RS-485 interface
  E5□Z-□3□01: RS-232C interface

Note

1. CompoWay/F is an integrated general-purpose serial communications protocol developed by OMRON. It uses commands compliant with the well-established FINS, together with a consistent frame format on OMRON Programmable Controllers to facilitate communications between personal computers and components.
2. SYSWAY communications cannot be used for the alarm 3 output.

1-3 Setting Level Configuration and Key Operations

Parameters are divided into groups, each called a “level”. Each of the set values (setup items) in these levels are called a “parameter.” The parameters on the E5AZ/E5EZ are divided into the following six levels:



Note :
Communications setting level is displayed when the optional communications unit E53-AZ01 or E53-AZ03 is mounted along with the E53-AZM option board.

The key pressing time can be changed in "Move to protect level time" (advanced function setting level).

Control in progress

Control stopped

	Control in Progress	Control Stopped
Protect level	Can be set.	-
Operation level	Can be set.	-
Adjustment level	Can be set.	-
Initial setting level	-	Can be set.
Advanced function setting level (See note.)	-	Can be set.
Communications setting level	-	Can be set.

Note Set the parameters in the “initial setting/communications protect” under “protect level” to “0”, to activate advanced function setting level.

Of these levels, the initial setting level, communications setting level, and advanced function setting level can be used only when control has stopped. Note that controller outputs are stopped when any of these three levels are selected.

Protect level

- To move to this level, simultaneously press the ◯ and ⮌ keys for at least three seconds in the operation level or adjustment level. This level is for preventing unwanted or accidental modification of parameters. Protected levels will not be displayed, and so the parameters in that level cannot be modified.

  Note The key pressing time can be changed in "Move to protect level time" (advanced function setting level).

Operation level

- This level is displayed when you turn the power ON. You can move to the protect level, initial setting level and adjustment level from this level.
- Normally, select this level during operation. During operation, the process value and manipulated variable can be monitored, and the set points, alarm values and upper- and lower-limit alarms can be monitored and modified.

Adjustment level

- To move to this level, press the ◯ key for less than one second.
- This level is for entering set values and offset values for control. This level contains parameters for setting the AT (auto-tuning), communications writing enable/disable, hysteresis, multi-SP, input shift values, heater burnout alarm (HBA) and PID constants. You can move to the top parameter of the initial setting level, protect level, and operation level from here.

Initial setting level

- To move to this level, press the ◯ key for at least three seconds in the operation level or adjustment level. The PV display flashes after one second. This level is for specifying the input type, selecting the control method, control period, setting direct/reverse operation and alarm type. You can move to the advanced function setting level or communications setting level from this level. To return to the operation level, press the ◯ key for at least one second. To move to the communications setting level, press the ◯ key for less than one second.

Advanced function setting level

- To activate this level, set the parameters in the “initial setting/communications protect” under the “protect level” to “0” and then enter the password (“–169”) in the initial setting level.
- The initial setting level can be accessed from this level.
- This level is for setting the automatic display return time, MV limiter, event input assignment, standby sequence, alarm hysteresis, and ST (self-tuning).

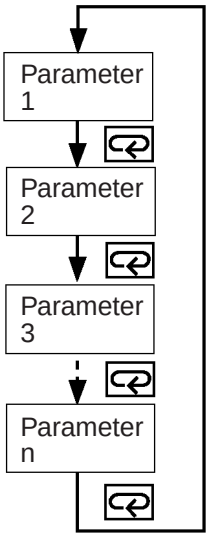
Communications setting level

- To move to this level, press the ◯ key for less than one second in the initial setting level. When the communications function is used, set the communications conditions in this level. Communicating with a personal computer (host computer) allows set points to be read and written, and manipulated variables to be monitored.

  Note This level is available if a communications unit (E53-AZ01 or E53-AZ03) is fitted to the unit along with the E53-AZM option board.

1-3-1 Selecting Parameters

- To select parameters in each level, press the [key] key. Each press of the [key] key advances to the next parameter. For details on each parameter, see *Section 5*.



1-3-2 Fixing Settings

- If you press the [key] key at the final parameter, the display returns to the top parameter for the current level.
- To change parameter settings or setup, specify the setting using the [key] or [key] key, and either leave the setting for at least two seconds or press the [key] key. This fixes the setting.
- When another level is selected, the parameter and setting on the display are fixed.
- When you turn the power OFF, you must first fix the settings or parameter setup (by pressing the [key] key). The settings and parameter setup are sometimes not changed by merely pressing the [key] or [key] key.

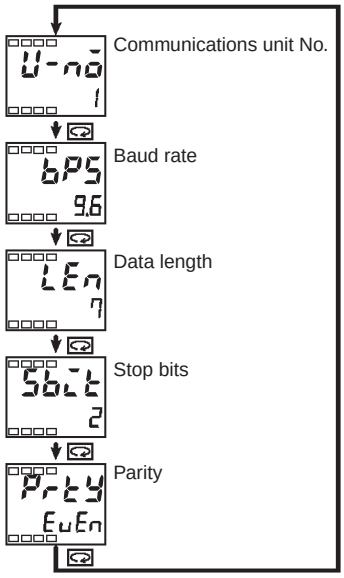
1-4 Communications Function

The E5AZ/E5EZ can be provided with a communications function that allows you to check and set controller parameters on a host computer. If the communications function is required, mount the option unit E53-AZ01 or E53-AZ03 in the E5AZ/E5EZ. For details on the communications function, see the separate *Communications User's Manual* (Cat. No. H204).
Follow the procedure below to move to the communications setting level.

1,2,3...

1. Press the [key] key for at least three seconds in the "operation level". The level moves to the "initial setting level".
2. Press the [key] key for less than one second. The "initial setting level" moves to the "communications setting level".

3. Pressing the key advances the parameters as shown in the following figure.
4. Press the or key to change the parameter setups.



Setting up communications data

Set the E5AZ/E5EZ communications specifications so that they match the communications setup of the host computer.

Parameter	Displayed Characters	Set (monitor) Value	Settings	Default	Unit
Communications unit No.	U-no	0 to 99		1	None
Baud rate	bPS	1.2, 2.4, 4.8, 9.6, 19.2	1.2, 2.4, 4.8, 9.6, 19.2	9.6	kbps
Data length	LEn	7, 8		7	bit
Stop bits	Sbit	1, 2		2	bit
Parity	Prty	None, even, odd	none, EuEn, odd	Even	None

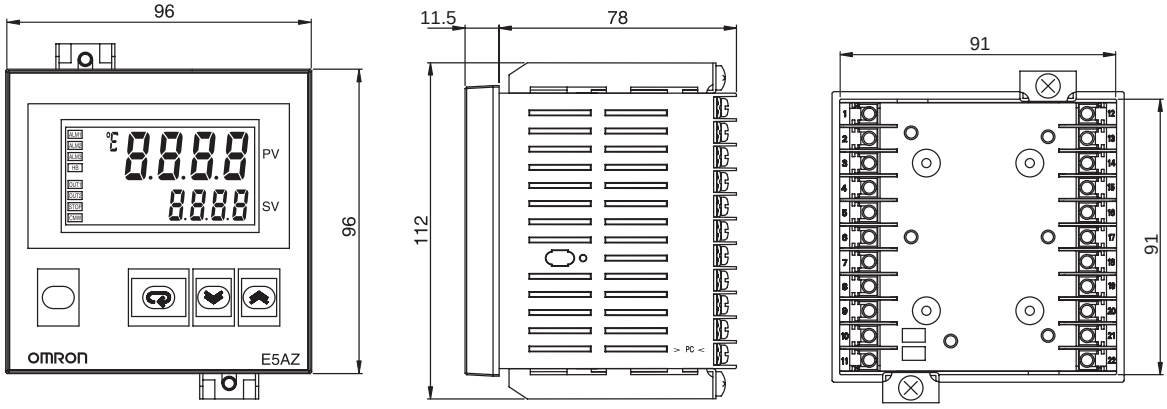
SECTION 2
Preparations

This section describes the work required to prepare the E5AZ/E5EZ Digital Temperature Controllers for operation, including installation and wiring.

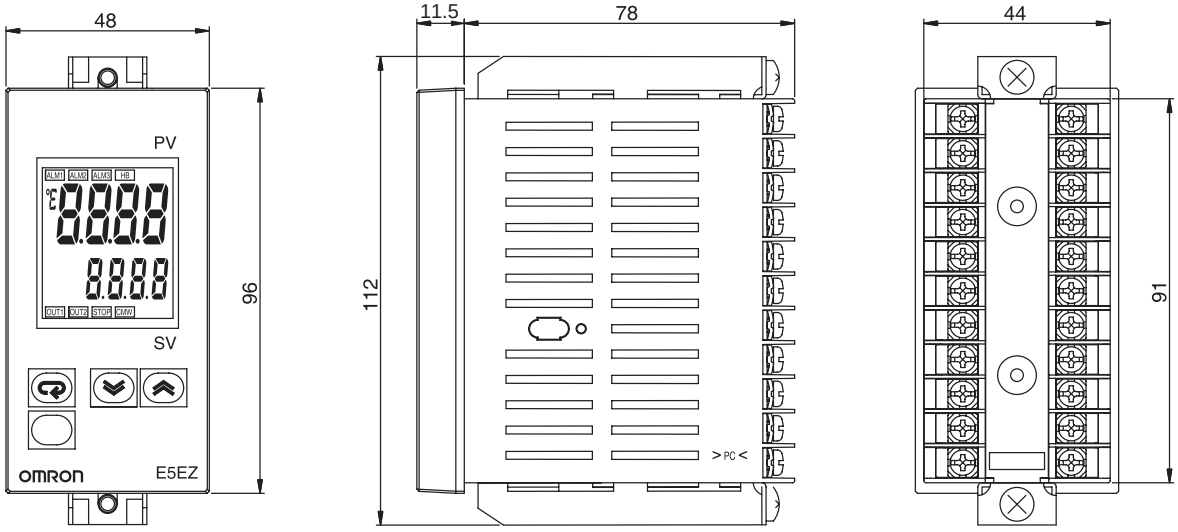
2-1 Installation

2-1-1 Dimensions

E5AZ (Unit: mm)

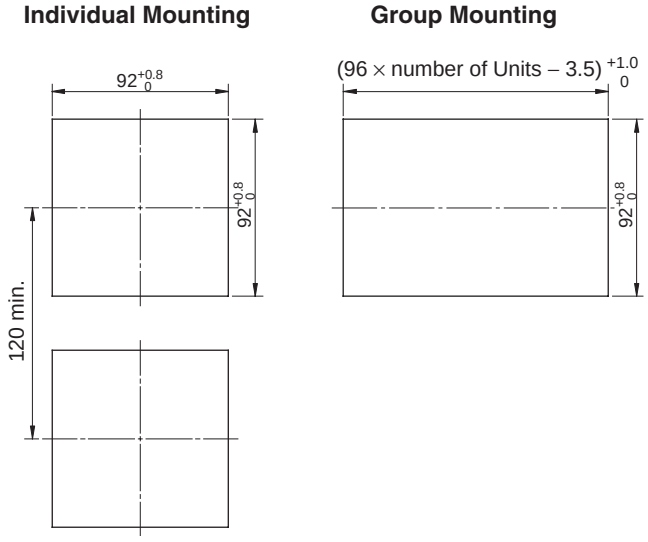


E5EZ (Unit: mm)

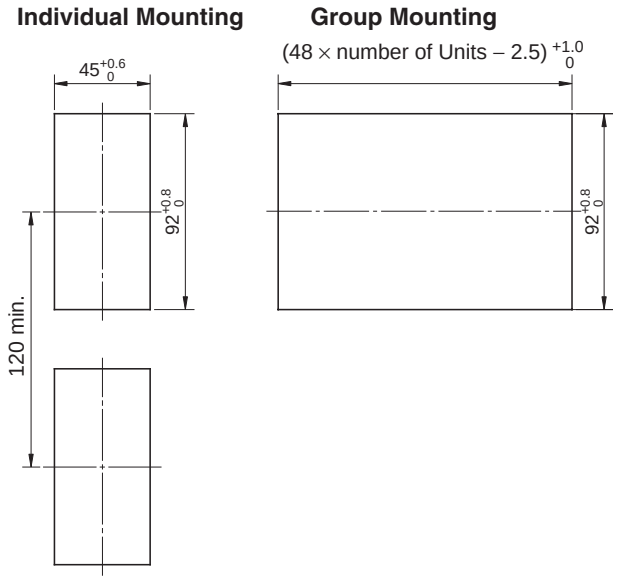


2-1-2 Panel Cutout

E5AZ (Unit: mm)



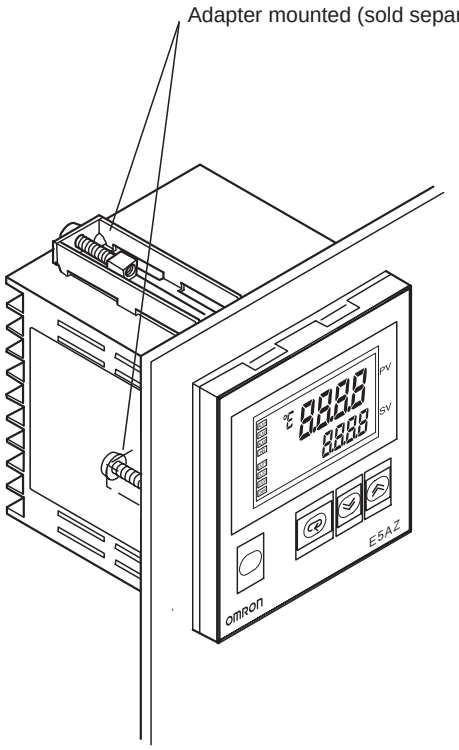
E5EZ (Unit: mm)



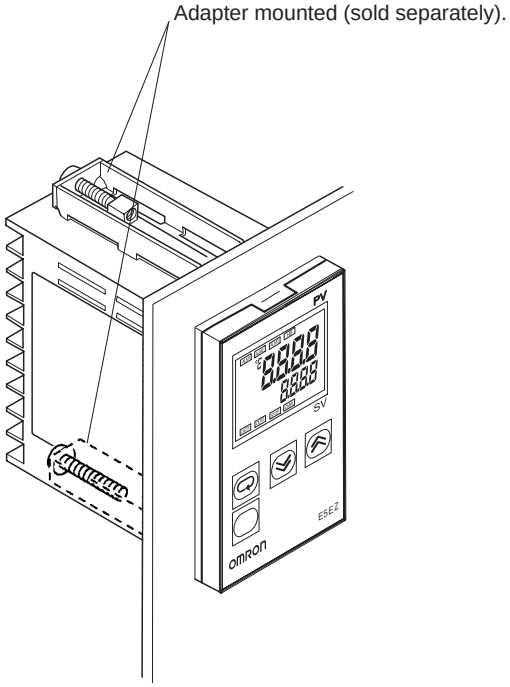
- The recommended panel thickness is 1 to 8 mm.
- Units must not be closely mounted vertically. (Observe the recommended mounting space limits.)
- When group mounting several Controllers, ensure that the surrounding temperature does not exceed the ambient operating temperature listed in the specifications.

2-1-3 Mounting

E5AZ



E5EZ



Mounting to the Panel

1,2,3... 1. Insert the E5AZ/E5EZ into the square mounting hole in the panel (thickness: 1 to 8 mm). Attach the Mounting Brackets provided with the product to the mounting grooves on the top and bottom surfaces of the rear case.

2. Use a ratchet to alternately tighten the screws on the top and bottom Mounting Brackets little by little to maintain balance, until the ratchet turns freely.

2-1-4 Setting up the Option Units

If heater burnout alarm, communications and event input functions are required, mount a heater burnout alarm unit (E53-AZH), a communications unit (E53-AZ01 or E53-AZ03), or an event input unit (E53-AZB).

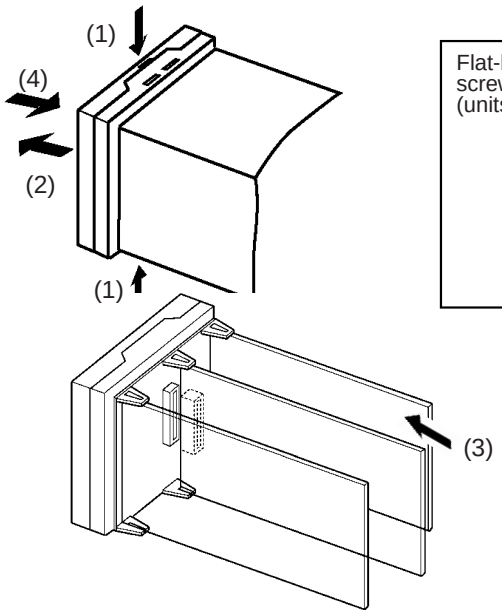
The E5AZ/E5EZ provides optional functions when an E53-AZM option board is mounted along with one or two (E53-AZH and another) option units.

Option units

Name	Model	Function
Option Board	E53-AZM	Option board is mounted along with one or two of the following option units.
Heater Burnout Alarm Unit	E53-AZH	Heater burnout alarm
Communications Unit	E53-AZ01	RS-232C communications
	E53-AZ03	RS-485 communications
Event Input Unit	E53-AZB	Event input

- Terminal label: × 1

Assembling the unit



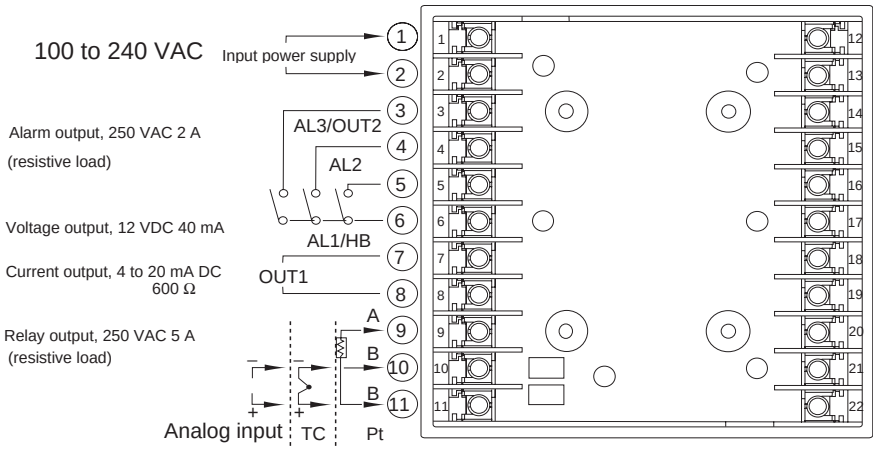
1,2,3...

1. Insert the tools (see drawing above) into the slots (one on the top and one on the bottom) and release the hooks.
2. Insert the tool into the gap between the front and rear, and slightly draw out the front panel. Then, draw out the front panel towards you holding it by its top and bottom sides.
3. Match the upper and lower claws with the connection points and insert the option board (E53-AZM) after the option unit (E53-AZH, E53-AZ01, E53-AZ03, or E53-AZB) is attached to the board. Mount the option board in the left from the front.
4. Before you push the unit back into the case, make sure that the packing is in place. Push the unit back into the rear case until you hear a click. When you do this, hold down the hooks on the top and bottom of the rear case so that they are firmly hooked in place.

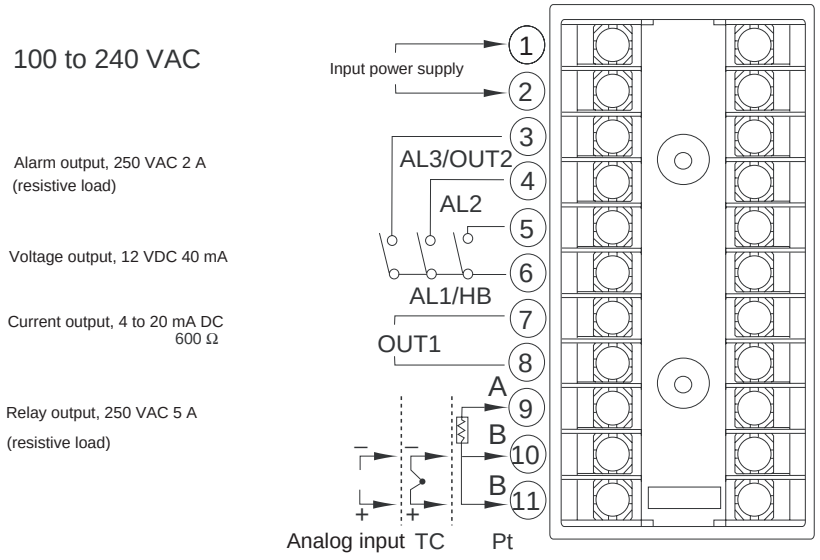
2-2 Wiring Terminals

2-2-1 Terminal Arrangement

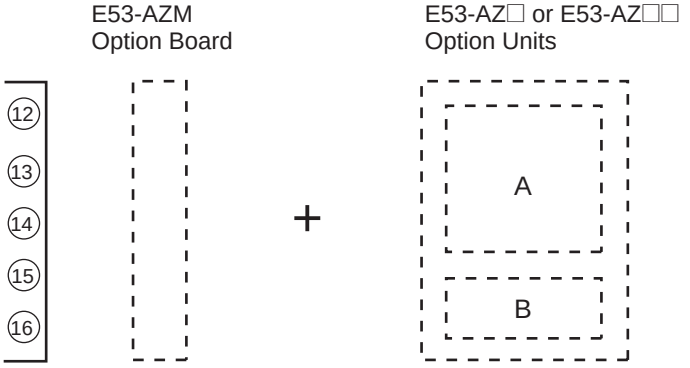
E5AZ



E5EZ

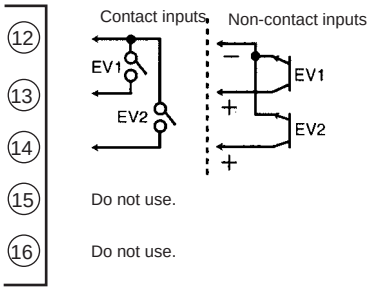


Option Units

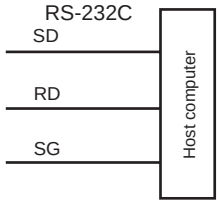


Note The E53-AZM option board is always mounted along with one or two (E53-AZH and another) option units.

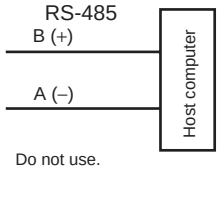
A E53-AZB
Even Inputs



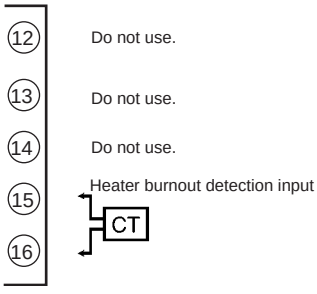
E53-AZ01
Communications



E53-AZ03
Communications



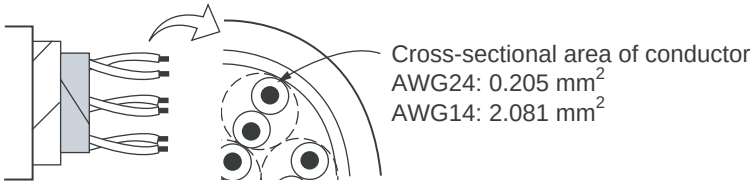
B E53-AZH
Heater Burnout Detection



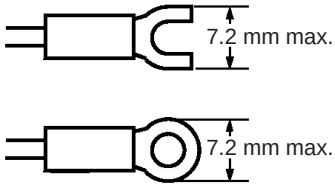
Note The combination of A and B is also available.

2-2-2 Precautions when Wiring

- Separate input leads and power lines in order to protect the E5AZ/E5EZ and its lines from external noise.
- Use AWG24 (cross-sectional area: 0.205 mm^2) to AWG14 (cross-sectional area: 2.081 mm^2) twisted-pair cable (stripping length: 5 to 6 mm).



- We recommend using solderless terminals when wiring the E5AZ/E5EZ.
- Tighten the terminal screws using a torque no greater than 0.74 to 0.90 N·m.
- Use the following type of solderless terminals for M3.5 screws.



2-2-3 Wiring

Power supply

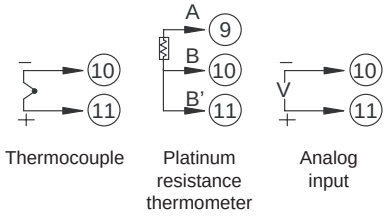
- Connect to terminals 1 and 2. The following table shows the specifications.

Input power supply	E5AZ/E5EZ
100 to 240 VAC, 50/60 Hz	10 VA

- Reinforced insulation is applied between the input power supply and the I/O sections.

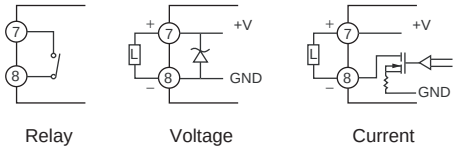
Input

- Connect to terminals 9 to 11 as follows according to the input type.



Control output 1

- Terminals 7 and 8 are for control output. The following diagrams show the available outputs and their internal equalizing circuits.



- The following table shows the specifications for each output type.

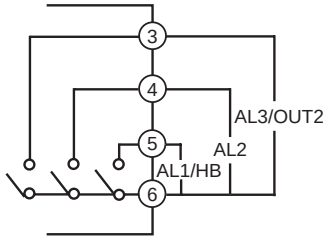
Output type	Specifications
Relay	250 VAC, 5 A (resistive load), electrical life: 100,000 operations
Voltage (PNP)	PNP type, 12 VDC, 40 mA (with short-circuit protection)
Current	4 to 20 mA DC, load: 600 Ω max., resolution: approx. 2,600

- The voltage output (control output) is not electrically insulated from the internal circuits. When using a grounding thermocouple, do not connect the control output terminals to the ground. If the control output terminals are connected to the ground, errors will occur in the measured temperature values as a result of leakage current.

Alarm output/Control output 2

- On the E5□Z-□3□□, alarm output 1 (ALM1) is across terminals 5 and 6, and alarm output 2 (ALM2) is across terminals 4 and 6, and alarm output 3 (ALM3) is across terminals 3 and 6. When heating/cooling control is used, alarm output 3 becomes cooling output.

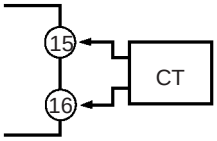
  When the input error output is set to “ON”, alarm output 1 turns ON when an input error occurs.
- Terminals 5 and 6 on the E5AZ/E5EZ to which an E53-AZH Option Unit is mounted output the alarm output 1 or heater burnout alarm values. If the mode of alarm output 1 is set to 0 to disable alarm output 1, terminals 5 and 6 will output the heater burnout alarm.
- The equivalent circuits of alarm output 1, 2, and 3 are shown in the following diagram.



- Relay specifications are as follows:
  SPST-NO 250 VAC 2 A

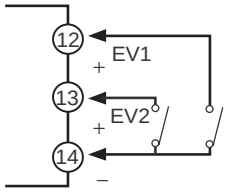
CT input

- When the option unit (E53-AZH) is mounted on the E5AZ/E5EZ and the heater burnout function is used, connect a current transformer (CT) across terminals 15 and 16.



Event input

- When the option event input unit E53-AZB is mounted in the E5AZ/E5EZ and event input is used, connect to terminals 12 to 14.

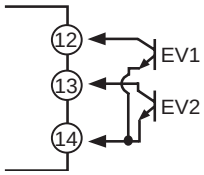


- Use event inputs under the following conditions:

- The output current is approx. 7 mA.

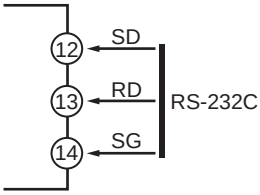
Contact input ON: 1 kΩ max., OFF: 100 kΩ min.
No-contact input ON: residual voltage 1.5 V max., OFF: leakage current 0.1 mA max.

Polarities during no-contact input are as follows:

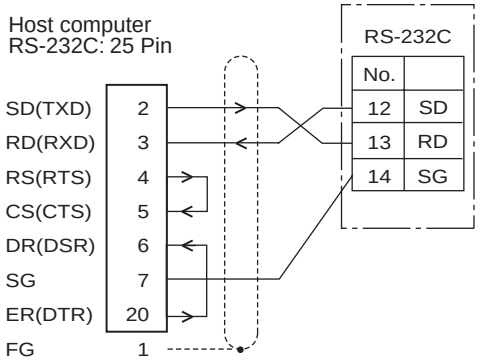


RS-232C Communications

- When the E53-AZ01 option communications unit is mounted in the E5AZ/E5EZ for communicating with a host computer, connect the communications cable across terminals 12, 13, and 14.



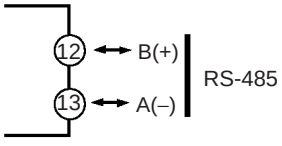
Communications Unit Wiring Diagram



- The RS-232C connection is 1:1.
- The maximum cable length is 15 m. Use the RS-232C optical interface cable (Z3RN) as an extension cable if necessary.
- Use AWG24 (cross-sectional area: 0.205 mm^2) to AWG14 (cross-sectional area: 2.081 mm^2) shielded twisted-pair cable.

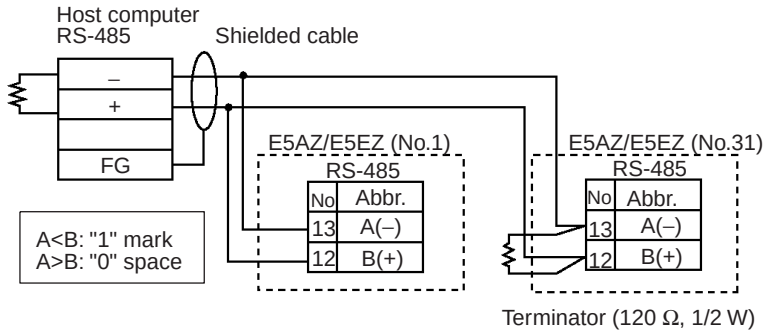
RS-485 Communications

- When the E53-AZ03 option communications unit is mounted in the E5AZ/E5EZ for communicating with a host computer, connect the communications cable across terminals 12 and 13.
  Specify both ends of the transmission path including the host computer as the end node (that is, connect terminators to both ends).
  The maximum terminal resistance is 54 Ω.



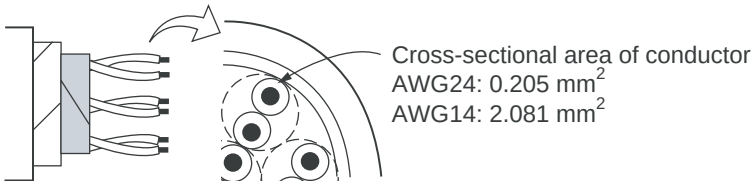
- To satisfy the requirements of the EN 61326 class A standard in the conducted emission test, add a clamp filter (TDK: ZAT1730-0730) in the communications line between the K3SC and the Temperature Controller.

Communications Unit Wiring Diagram



- The RS-485 connection can be either one-to-one to one-to-N. Up to 32 units including the host computer can be connected in one-to-N systems. Use AWG24 (cross-sectional area: 0.205 mm^2) to AWG14 (cross-sectional area: 2.081 mm^2) shielded twisted-pair cable and keep the total cable length to 500 m.

Cable reference diagram



2-3 Requests at Installation

2-3-1 To Ensure Prolonged Use

Use the temperature in the following operating environment:
Temperature: –10 to +55°C (icing and condensation not allowed)
Humidity: 25 to 85%
When the temperature controller is incorporated in a control panel, make sure that the controller's ambient temperature and not the panel's ambient temperature does not exceed 55°C.
The life of electronic equipment such as temperature controllers is influenced not only by the life determined by the relay switching count but also by the life of the electronic components used internally. The service life of components is dependent on the ambient temperature: the higher the ambient temperature becomes, the shorter the service life becomes, and vice versa. For this reason, the service life of the temperature controller can be extended by lowering its internal temperature.
Gang-mounting two or more temperature controllers, or mounting temperature controllers above each other may cause heat to build up inside the temperature controllers, which will shorten their service life. When mounting temperature controllers like this, forced cooling measures such as a cooling fan for cooling the temperature controllers must be taken into consideration.
Prevent only the terminal block from being cooled. Otherwise, this may result in a measurement error.

2-3-2 To Reduce the Influence of Noise

To reduce induction noise, the leads on the temperature controller's terminal block must be wired separately from large-voltage/large-current power leads. Also, avoid wiring leads in parallel with power leads or in the same wiring path. Other methods such as separating conduits and wiring ducts, or using shield wire are also effective.
Attach a surge absorber or noise filter to peripheral equipment that generates noise (in particular, motors, transformers, solenoids, or other equipment that has a magnetic coil or other inductance component).
When a noise filter is used at the power supply, first check the voltage or current, and attach the noise filter as close as possible to the temperature controller.
Also, install the temperature controller as far away as possible from equipment that generates strong, high frequency (e.g. high-frequency welders, high-frequency sewing machines) or surges.

2-3-3 To Ensure High-precision Measurement

When the thermocouple leads are extended, be sure to use a compensating lead wire matched to the type of thermocouple.
When the platinum resistance detector leads are extended, use the lead having the smallest resistance to equalize the resistance of the three leads.
Install the temperature controller so that it is horizontal.
If there is a large error in the measurement values, make sure that input compensation has been set correctly.

SECTION 3
Basic Operation

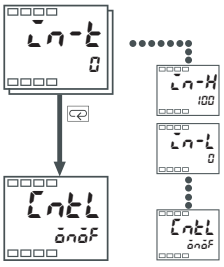
This section describes the basic operation of the E5AZ/E5EZ Digital Temperature Controllers, including key operations to set parameters and descriptions of display elements based on specific control examples.

3-1 Initial Setting Examples

On previous controllers, sensor input type, alarm type and control period were set by the DIP switches. These hardware settings are now set in parameters in setup menus. The ◯ and ⮌ keys are used to switch between setup menus, and the amount of time that you hold the keys down for determines which setup menu you move to. This section describes two typical examples.

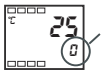
Interpretations and Meanings of Typical Examples

Changing Setting Value



Indicates the continued presence of set data. This should be pressed ◯ continuously prior to switching to any other data objectives.

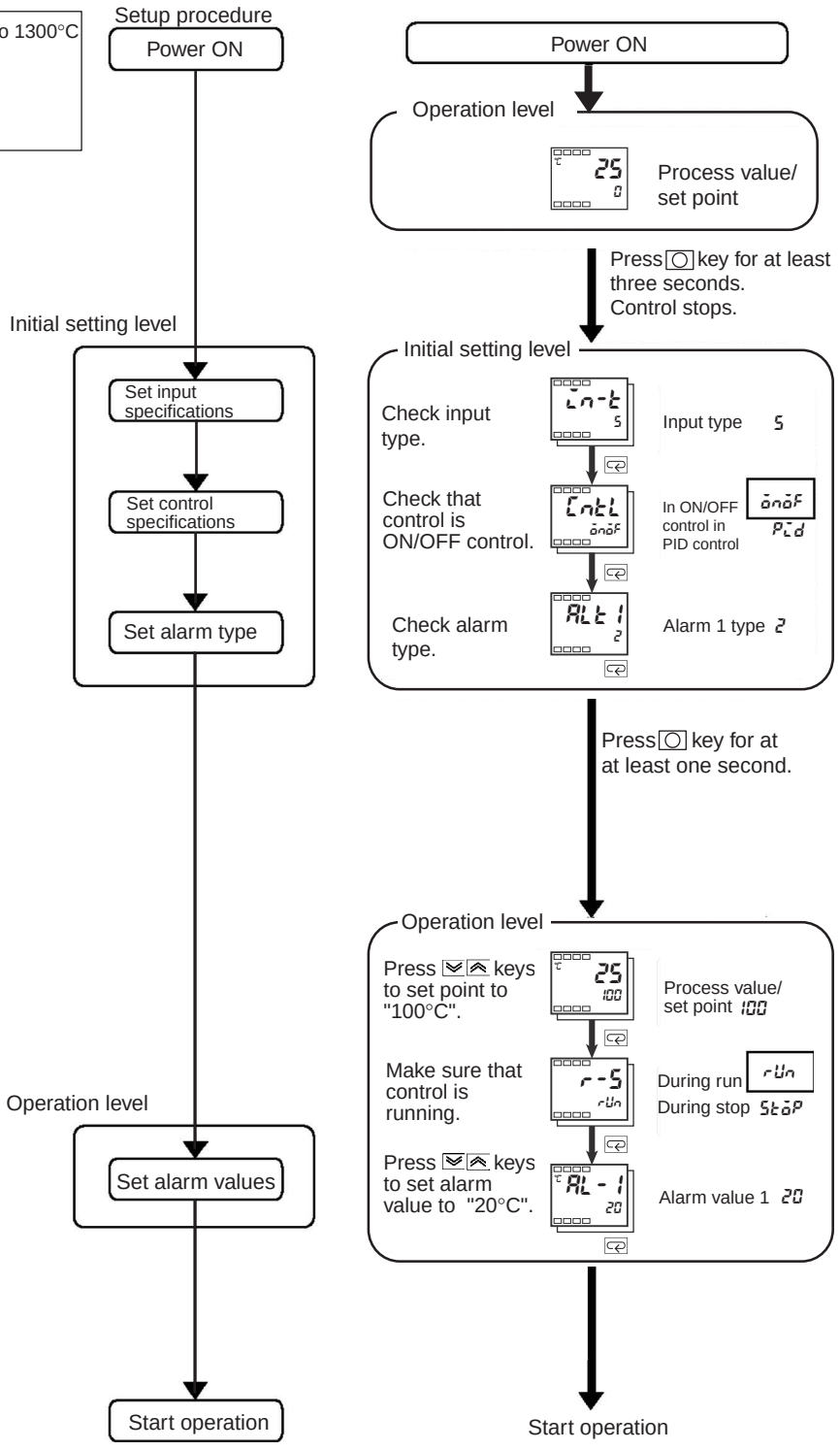
Changing Numeric Value



Each interface' value and their selection are realized through ⮝⮟ this option.

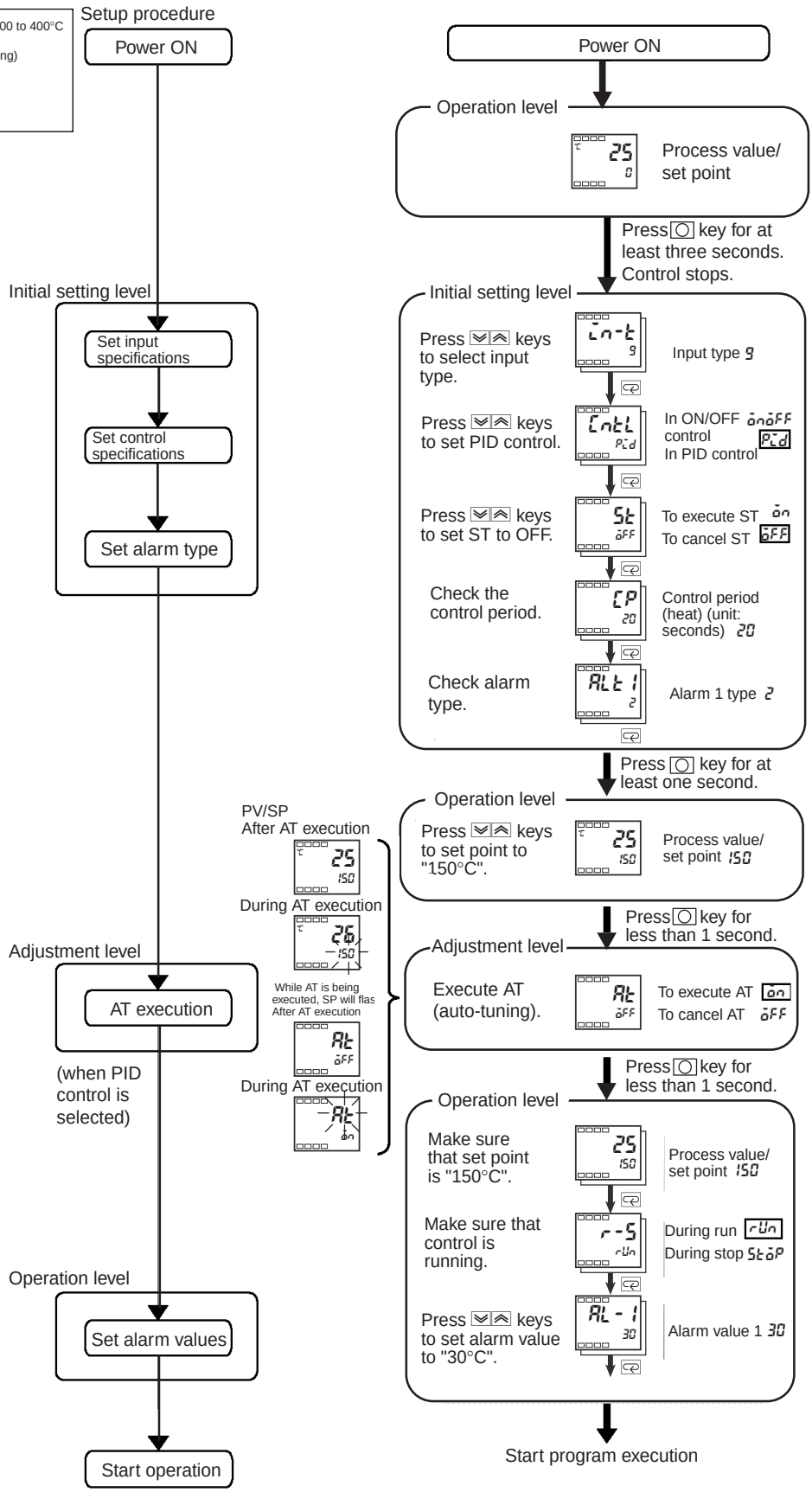
Typical example 1

Input type:	5 K thermocouple –200 to 1300°C
Control method:	ON/OFF control
Alarm type:	2 upper limit
Alarm value 1:	20°C (deviation)
Set point:	100°C



Typical example 2

Input type:	9 T thermocouple –200 to 400°C
Control method:	PID control
Calculate PID constants by AT (auto-tuning) execution.	
Alarm type:	2 upper limit
Alarm value 1:	30°C (deviation)
Set point:	150°C



3-2 Setting the Input Type

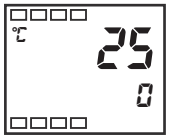
The E5AZ/E5EZ supports four input types: platinum resistance thermometer, thermocouple, infrared temperature sensor and analog inputs. Set the input type matched to the sensor used in the "input type" parameter. In the product specifications, there are models with thermocouple/resistance thermometer inputs (multi-input) and models with analog input. The settings differ depending on the model. Check to make sure which model you are using.

3-2-1 Input Type

Operation Procedure

Setting the input type "thermocouple K –20.0 to 500.0°C".

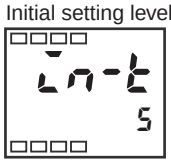
Operation level



1,2,3...

1. Press the ◯ key for at least three seconds to move from the "operation level" to the "initial setting level".

Initial setting level



Input type

2. Press the ^ key to enter the set value of the desired sensor. When you use K thermocouple (–20.0 to 500.0°C), enter "6" as the set value.

Hint: The set value is fixed if you do not operate the keys on the front panel for two seconds after changing the parameter, or by pressing the ◯ or ↩ key.

List of Input Types

Input type	Name	Set Value	Input Temperature Setting Range
Platinum resistance thermometer	Pt100	0	–200 to 850 (°C)/–300 to 1500 (°F)
		1	–199.9 to 500.0 (°C)/–199.9 to 900.0 (°F)
		2	0.0 to 100.0 (°C)/0.0 to 210.0 (°F)
	JPt100	3	–199.9 to 500.0 (°C)/–199.9 to 900.0 (°F)
		4	0.0 to 100.0 (°C)/0.0 to 210.0 (°F)
Thermocouple	K	5	–200 to 1300 (°C)/–300 to 2300 (°F)
		6	–20.0 to 500.0 (°C)/0.0 to 900.0 (°F)
	J	7	–100 to 850 (°C)/–100 to 1500 (°F)
		8	–20.0 to 400.0 (°C)/0.0 to 750.0 (°F)
	T	9	–200 to 400 (°C)/–300 to 700 (°F)
		22	–199.9 to 400.0 (°C)/ –199.9 to 700.0 (°F)
	E	10	0 to 600 (°C)/ 0 to 1100 (°F)
	L	11	–100 to 850 (°C)/–100 to 1500 (°F)
	U	12	–200 to 400 (°C)/–300 to 700 (°F)
		23	–199.9 to 400.0 (°C)/–199.9 to 700.0 (°F)
	N	13	–200 to 1300 (°C)/–300 to 2300 (°F)
	R	14	0 to 1700 (°C)/0 to 3000 (°F)
	S	15	0 to 1700 (°C)/0 to 3000 (°F)
	B	16	100 to 1800 (°C)/ 300 to 3200 (°F)
Infrared temperature sensor ES1B	10 to 70°C	17	0 to 90 (°C)/0 to 190 (°F)
	60 to 120°C	18	0 to 120 (°C)/0 to 240 (°F)
	115 to 165°C	19	0 to 165 (°C)/0 to 320 (°F)
	140 to 260°C	20	0 to 260 (°C)/0 to 500 (°F)
Analog input	0 to 50mV	21	One of the following ranges depending on the results of scaling: –1999 to 9999, –199.9 to 999.9,

Note The default is "5".

3-3 Selecting the Temperature Unit

3-3-1 Temperature Unit

- Select either "°C" or "°F" as the temperature unit.
- Set the temperature unit in the "temperature unit" parameter of "initial setting level". Default is "C: °C".

Operation Procedure

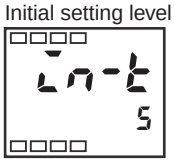
Select "°C".

Operation level

1,2,3...

1. Press the ◯ key for at least three seconds to move from the "operation level" to the "initial setting level".

Initial setting level



Input type

2. Select the "temperature unit" parameter by pressing the ⟲ key.
   Press the ∧ or ∨ key to select either "°C" or "°F".
   C: °C F: °F

Temperature unit

3. To return to the "operation level" press the ◯ key for at least one second.

3-4 Selecting PID Control or ON/OFF Control

The E5AZ/E5EZ supports two control methods, 2-PID control and ON/OFF control. The control method is selected by the “PID ON/OFF” parameter in the “initial setting level”. When this parameter is set to “2PID”, 2-PID control is set, and when set to “onOF”, ON/OFF control is set (default).

2-PID control

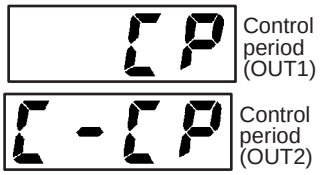
PID control is set by AT (auto-tuning), ST (self-tuning) or manual setup.
For PID control, set the PID constants in the “proportional band (P)”, “integral time (I)” and “derivative time (D)” parameters.

ON/OFF control

In “ON/OFF” control, the control output is turned ON when the process value is lower than the current set point, and the control output is turned OFF when the process value is higher than the current set point (reverse operation).

3-5 Setting Output Specifications

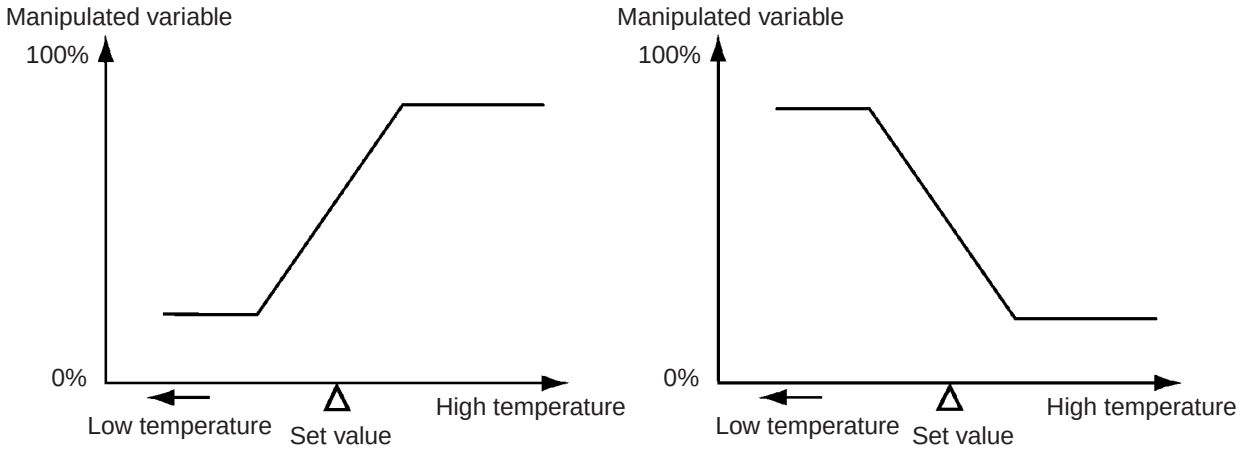
3-5-1 Control Period



- Set the output period (control period). Though a shorter period provides better control performance, we recommend setting the control period to 20 seconds or more taking the life expectancy in the case of relay output into consideration. If necessary, readjust the control period by trial operation, for example, when the control period parameters are set to their defaults.
- Set the control period in the “control period (OUT1)” and “control period (OUT2)” parameters (initial setting level). Default is “20 seconds”.
- The “control period (OUT2)” parameter can be used only in heating/cooling control.
- Whenever control output 1 is the current output, “control period (OUT1)” cannot be used.

3-5-2 Direct/Reverse Operation

- “Direct operation” refers to control where the manipulated variable is increased according to the increase in the process value. Alternatively, “Reverse operation” refers to control where the manipulated variable is decreased according to the increase in the process value.



For example, when the process value (PV) (temperature) is lower than the set point (SP) (temperature) in a heating control system, the manipulated variable increases by the difference between the PV and SP values.
Accordingly, this becomes “reverse operation” in a heating control system, or alternatively, “direct operation” in a cooling control system.

- Direct/reverse operation is set in the “direct/reverse operation” parameter (initial setting level). The “direct/reverse operation” parameter default is “reverse operation”.

Operation Procedure

In this example, let's monitor the "input type", "temperature unit", "direct/reverse operation" and "control period (OUT1)" parameters.

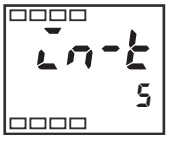
"input type" = "5": K thermocouple
"temperature unit" = "C": °C
"direct/reverse operation" = "or-r": reverse operation
"control period (OUT1)" = "20 (secs)"

Operation level

1,2,3...

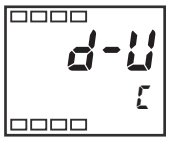
1. Press the ◯ key for at least three seconds to move from the "operation level" to the "initial setting level".

Initial setting level



Input type

2. The input type is displayed. When you are setting the input type for the first time, "5": K thermocouple is set. To select a different sensor, press the ⋀ or ⋁ key.

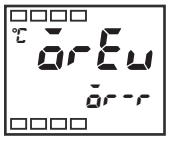


Temperature unit

3. Select the "temperature unit" parameter by pressing the ↺ key. Default is "C": °C. To select "F": °F, press the ⋀ key.

Control period (OUT1)

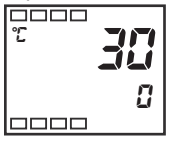
4. Select the "control period (OUT1) parameter by pressing the ↺ key. Default is "20".



Direct/reverse operation

5. Select the "direct/reverse operation" parameter by pressing the ↺ key. Default is "or-r": reverse operation. To select "or-d": direct operation, press the ⋀ key.

Operation level



PV/SP

6. To return to the "operation level", press the ◯ key for at least one second.

3-6 Setting the Set Point (SP)

Operation level

The “operation level” is displayed when the E5AZ/E5EZ is turned ON. The upper display (No.1 display) displays the process value, and the lower display (No.2 display) displays the set point.

3-6-1 Changing the SP

- The set point cannot be changed when the “operation/adjustment protect” parameter is set to “3”. For details, see *4-9 Using the Key Protect Level*.
- To change the set point, press the ▲▲ or ▼▼ key in the “PV/SP” parameter (operation level), and set the desired set value. The new set point is selected two seconds after you have specified the new value.
- Multi-SP is used to switch between two or four set points. See *4-5 Using Event Inputs* for details.

In this example, let’s change the set point from “0°C” to “200°C”.

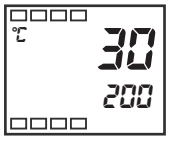
Operation Procedure

1,2,3...

1. Normally, the “PV/SP” parameter is displayed. The set point is “0°C”.

Operation level

2. Press the ▲▲ key until the set point changes to “200°C”.



3-7 Using ON/OFF Control

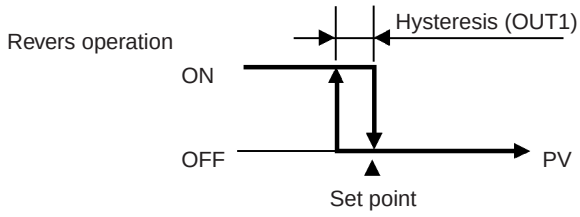
In “ON/OFF” control, the control output turns OFF when the currently controlled temperature reaches a preset set point. When the manipulated variable turns OFF, the temperature begins to fall and the control turns ON again. This operation is repeated at a certain point. At this time, how much the temperature must fall before control turns ON again is determined by the “hysteresis (OUT1)” parameter. Also, how much the manipulated variable must be adjusted in response in the increase or decrease in the process value is determined by “direct/reverse operation” parameter.

3-7-1 ON/OFF Control

- Switching between 2-PID control and ON/OFF control is carried out by the “PID ON/OFF” parameter (initial setting level). When this parameter is set to “PID”, 2-PID control is selected, and when set to “ONOF”, ON/OFF control is selected. Default is “ONOF”.

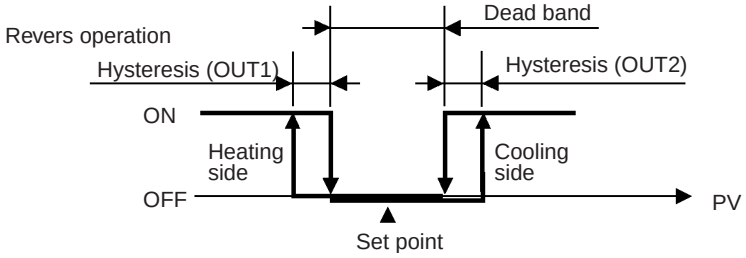
Hysteresis

- With ON/OFF control, hysteresis is used to stabilize operation when switching between ON and OFF.
  The control output (OUT1) and control output (OUT2) functions are set in the hysteresis (OUT1) and hysteresis (OUT2) functions respectively.
- In standard control (heating or cooling control), the setting of the “hysteresis (heating)” parameter in the adjustment level is used as the hysteresis regardless of whether the control type is heating control or cooling control.



3-position control

- In heating/cooling control, a dead band (an area where both control outputs are “0”) can be set to either the heating or cooling side. This makes it possible to use 3-position control.



Parameters

Symbol	Parameter Name: Level	Description
S-HC	Standard or heating/cooling: Initial setting level	For specifying control method
CntL	PID ON/OFF: Initial setting level	For specifying control method
orEv	Direct/reverse operation: Initial setting level	For specifying control method
C-SC	Cooling coefficient: Adjustment level	Heating/cooling control
C-db	Dead band: Adjustment level	Heating/cooling control
HYS	Hysteresis (OUT1): Adjustment level	ON/OFF control
CHYS	Hysteresis (OUT2): Adjustment level	ON/OFF control

3-7-2 Settings

To execute ON/OFF control, set the "set point," "PID ON/OFF" and "hysteresis" parameters.

Setting the PID ON/OFF parameter

Operation Procedure

In this example, let's first check that the "PID ON/OFF" parameter is set to "oNoF" in the "initial setting level".

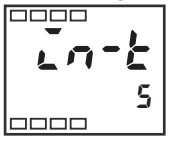
Operation level

PV

1,2,3...

1. Press the ◯ key for at least three seconds to move from the "operation level" to the "initial setting level".

Initial setting level



Input type

2. Display the "input type" parameter in the initial setting level.

PID ON/OFF

3. Select the "PID ON/OFF" parameter by pressing the ↩ key.
4. Check that the set value is "oNoF" (default).
5. Press the ◯ key for at least 1 second to return to the "operation level".

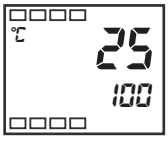
SP Setting

Operation Procedure

Next, set the set point value.

In this example, the set point is set to 200. The set value (i.e., the SP) is shown at the bottom of the display.

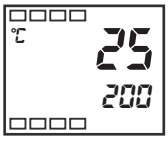
Operation level



PV/SP

1,2,3...

1. In the operation level, select "PV/SP".
2. Use the ∧ ∨ key to set the SP value (for example: 200). After pressing the ↩ key or waiting for at least two seconds, this value will be fixed.

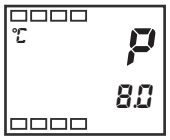


3-8 Determining PID Constants (AT, ST, Manual Setup)

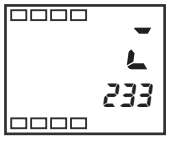
3-8-1 AT (Auto-tuning)

- When you execute auto-tuning, the optimum PID constants for the set point during program execution are automatically set by forcibly changing the manipulated variable to calculate the characteristics (called the “limit cycle method”) of the control target.
- To execute AT (auto-tuning), specify “on: AT execute”, and to cancel AT (auto-tuning), specify “oFF: AT cancel”.
- AT (auto-tuning) cannot be executed when control has stopped or during ON/OFF control.
- The result of AT (auto-tuning) is reflected in the “proportional band (P),” “integral time (I)” and “derivative time (D)” parameters in the “adjustment level”.

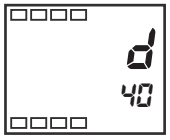
Adjustment level



Proportional band



Integral time

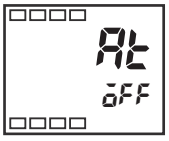


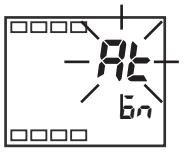
Derivative time

AT Operations

AT (auto-tuning) is started when the “AT execute/cancel” parameter is set to “ON”. During execution of AT, the No.1 display for the “AT execute/cancel” parameter blinks. When AT ends, the “AT execute/cancel” parameter turns OFF, and the No.1 display stops blinking.

AT execute/cancel



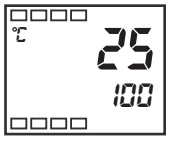


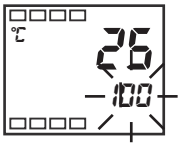
No.1 display

During AT execution

If you move to the “operation level” during AT execution, the No.2 display blinks to indicate that AT is being executed.

PV/SP





No.2 display

During AT execution

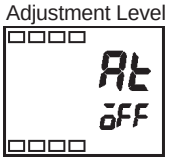
Only the “communications writing”, “run/stop” and “AT execute/cancel” parameters can be changed during AT execution. Other parameters cannot be changed.

Operation Procedure

Execute auto-tuning (AT).

1,2,3...

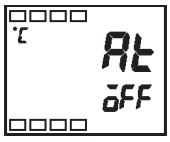
Adjustment Level



AT execute/ cancel

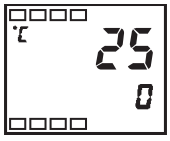
1. Press the ◯ key for less than one second to move from the “operation level” to the “adjustment level”.

2. Press the ^ key to start execution of AT (auto-tuning). “ON” is displayed during AT execution.



3. “OFF” is displayed when AT ends.

Operation level



PV

4. To return to the “operation level,” press the ◯ key.

About PID parameters

When control characteristics are already known, the PID parameters can be set directly to adjust control.
PID parameters are set in the "proportional band" (P), "integral time" (I) and "derivative time" (D) parameters in the "adjustment level".

3-8-2 ST (Self-tuning)

ST (self-tuning) is a function that finds PID constants by using step response tuning (SRT) when Controller operation begins or when the set point is changed.
Once the PID constants have been calculated, ST is not executed when the next control operation is started as long as the set point remains unchanged.

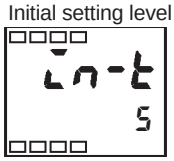
Operation Procedure

ST (self-tuning) is executed when the “ST” parameter is set to “ON” in the “initial setting level”.
When the ST function is in operation, be sure to turn the power supply of the load connected to the control output ON simultaneously with or before starting operation of the E5AZ/E5EZ.

Execute self-tuning (ST).

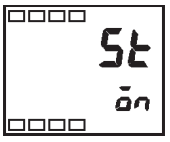
1,2,3...

Initial setting level



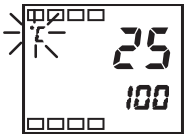
Input type

1. Press the ◯ key for at least three seconds to move from the “operation level” to the “initial setting level”.



ST

2. Select the “ST” parameter by pressing the ↺ key.
3. Press the ∧ key to select “on” (default).



ST

4. To return to the “operation level,” press the ◯ key. The temperature display blinks during self-tuning (ST) execution.

3-8-3 ST Start Conditions

Self-tuning by step response tuning (SRT) is started when the following conditions are met after program execution is started and the set point is changed.

At Start of Program Execution	When Set Point Is Changed
1. The set point at the start of program execution differs from the set point (See note 1.) when the previous SRT was executed. 2. The difference between the temperature at start of program execution is larger than (current proportional band×1.27+4°C) or the (ST stable range) whichever is larger. 3. The temperature at the start of program execution is smaller than the set point during reverse operation, and is larger than the set point during direct operation. 4. No reset from input error	1. The new set point differs from the set point (see note 1) used when the previous SRT was executed. 2. The set point change width is larger than (current proportional band×1.27+4°C) or the (ST stable range) whichever is larger. 3. During reverse operation, the new set point is larger than the set point before the change; and during direct operation, the new set point is smaller than the set point before the change. 4. The temperature is in a stable state (see note 2). (An equilibrium state is acceptable when the output is 0% when the power is turned ON.) (See note 3.)

Note

(1) The previous SRT-implemented set point is called the set point obtained by calculating the PID constant by the previous SRT.

(2) In this state, the measurement point is within the ST stable range.

(3) In this state, the change width of the PV every 60 seconds is at the ST stable range or less.

PID constants are not modified for the currently preset set point by self-tuning (ST) in the following instances:

1. When the PID constants have been changed manually with ST set to ON.
2. When auto-tuning (AT) has been executed.

3-8-4 ST Stable Range

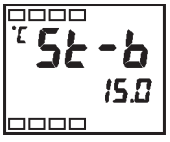
The ST stable range is a condition for determining the conditions under which ST (self-tuning) functions.
In this example, let's set the ST stable range to 20°C.

Operation Procedure

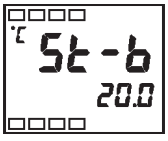
1,2,3...

1. Select the "ST stable range" parameter by pressing the key in the "advanced function setting level".
   To move to this level, see *4-8 Moving to the Advanced Function Setting Level*.

Advanced function setting level



ST stable range



2. Set to 20°C (deviation) using the or key.

3-8-5 Manual Setup

The individual PID constants can be manually set in the "proportional band", "integral time", and "derivative time" parameters in the "adjustment level".

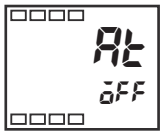
Operation Procedure

In this example, let's set the "proportional band" parameter to "10.0", the "integral time" parameter to "250" and the "derivative time" parameter to "45".

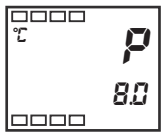
1,2,3...

1. Press the key to move from the "operation level" to the "adjustment level".

Adjustment level

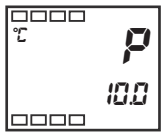


AT execute/ cancel

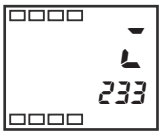


Proportional band

2. Select "proportional band" by pressing the key

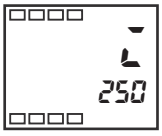


3. Press the or key to set the parameter to "10.0".

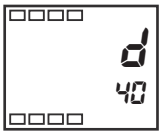


Integrated time

4. Select “integral time” by pressing the key.

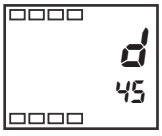


5. Press the or key to set the parameter to “250”.



Derivative time

6. Select “derivative time” by pressing the key.

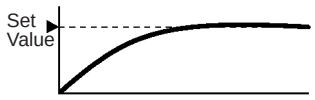
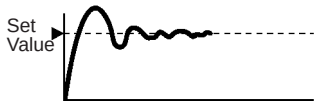


7. Press the or key to set the parameter to “45”.
8. To return to the “operation level,” press the key.

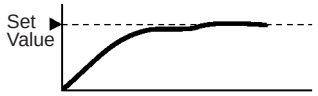
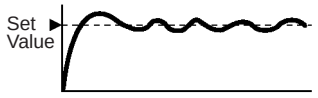
Proportional Operation

When PID constants I (integral time) and D (derivative time) are set to "0", control is executed according to proportional operation. The default set point becomes the center value of the proportional band.
Related parameter
"manual reset value" (adjustment level)

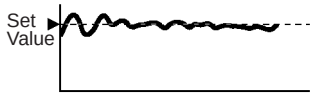
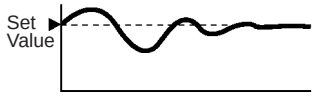
• When P (proportional band) is adjusted

When P is increased		The curve rises gradually, and a long stable time is achieved, preventing overshoot.
When P is decreased		Overshoot and hunting occur, however the set point is quickly reached after which the curve stabilizes.

• When I (integral time) is adjusted

When I is increased		It takes a long time for the process value to reach the set point. It takes time to achieve a stable state, however there is little overshoot/undershoot and hunting.
When I is decreased		Overshoot/undershoot and hunting occur, and the curve rises quickly.

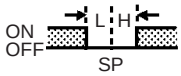
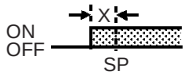
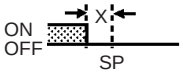
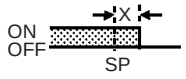
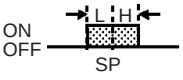
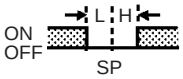
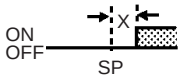
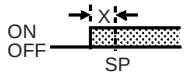
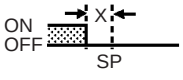
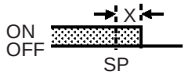
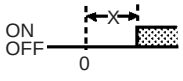
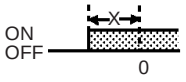
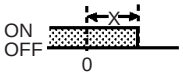
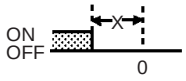
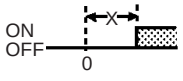
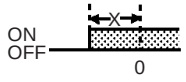
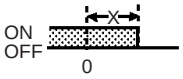
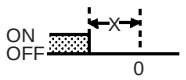
• When D (derivative time) is adjusted

When D is increased		Overshoot/undershoot and stable time are reduced, however, fine hunting occurs on changes in the curve itself.
When D is decreased		Overshoot/undershoot increase, and it takes time for the process value to reach the set point.

3-9 Alarm Outputs

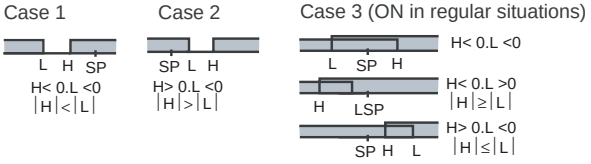
- Alarm output conditions are determined by a combination of the “alarm type”, “alarm value” and “alarm hysteresis” parameters. For details, refer to *4-2 Alarm Hysteresis*.
- The following describes the “alarm type”, “alarm value”, “upper-limit alarm” and “lower-limit alarm” parameters.

3-9-1 Alarm Types

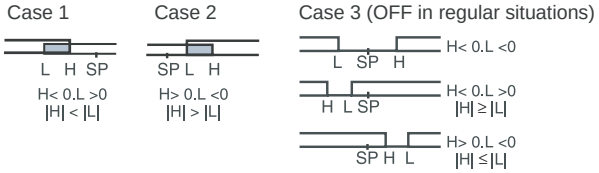
Set Value	Alarm Type	Alarm Output Operation	
		When alarm value X is positive	When alarm value X is negative
0	Alarm function OFF	Output OFF	
1	Upper- and lower-limit (deviation) (See note 1.)		(See note 2.)
2	Upper-limit (deviation)		
3	Lower-limit (deviation)		
4	Upper- and lower-limit range (deviation) (See note 1.)		(See note 3.)
5	Upper- and lower-limit alarm with standby sequence (deviation) (See note 1.)	 (See note 5.)	(See note 4.)
6	Upper-limit alarm with standby sequence (deviation)		
7	Lower-limit alarm with standby sequence (deviation)		
8	Absolute-value upper-limit		
9	Absolute-value lower-limit		
10	Absolute-value upper-limit with standby sequence		
11	Absolute-value lower-limit with standby sequence		

Note (1) With set values 1, 4 and 5, the upper- and lower-limit values can be set independently for each alarm point, and are expressed as “L” and “H”.

(2) Set value 1: Upper- and lower-limit alarms



(3) Set value 4: Upper- and lower-limit range alarm



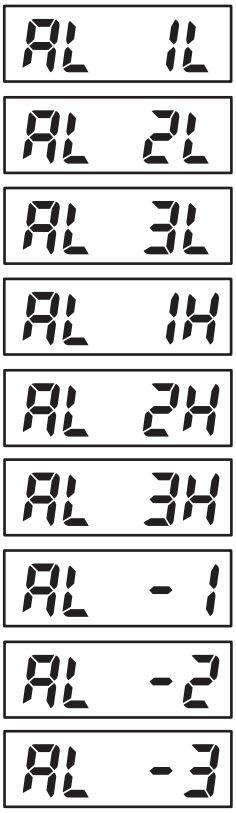
(4) Set value 5: Upper- and lower-limit alarms with standby sequence

- The upper- and lower-limit alarms described above.
- In cases 1 and 2, if there is significant overlap between the upper- and lower-limit values after hysteresis, the alarm will always be OFF. Examples of case 1 and 2 : In case 3, under general conditions, the alarm is turned OFF.

(5) Set value 5: Upper- and lower-limit alarms with standby sequence

If there is significant overlap between the upper- and lower-limit values after hysteresis, the alarm will always be OFF.

3-9-2 Alarm Values



Alarm value lower-limit

Alarm value upper-limit

Alarm value

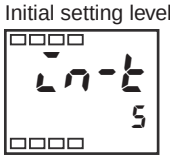
- Alarm values are indicated by “X” in the table on the previous page. When the upper and lower limits are set independently, “H” is displayed for upper limit values, and “L” is displayed for lower limit values.
- To set the alarm value for the upper and lower limits for deviation, set the upper and lower limits in each of the “alarm 1 upper limit”, “alarm 2 upper limit”, “alarm 3 upper limit”, “alarm 1 lower limit”, “alarm 2 lower limit” and “alarm 3 lower limit” parameters (operation level).

Operation Procedure

Set “alarm 1” to the upper-limit alarm. The following shows related parameters and setups. In this example, the alarm output is active when the set point is exceeded by “10°C”. (The temperature unit in this example is “°C”.)

“alarm 1 type” = “2: upper-limit alarm (deviation)”
“alarm value 1” = “10”

Initial setting level



1,2,3...

Input level

1. Press the ◯ key for at least three seconds to move from the “operation level” to the “initial setting level”.

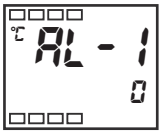
Alarm 1 type

2. Select the “alarm 1 type” parameter by pressing the ↺ key. Confirm that the set value is 2. The default value is 2 (Upper-limit alarm).

Operation level

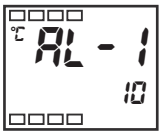
PV/SP

3. To return to the “operation level”, press the ◯ key for at least one second.



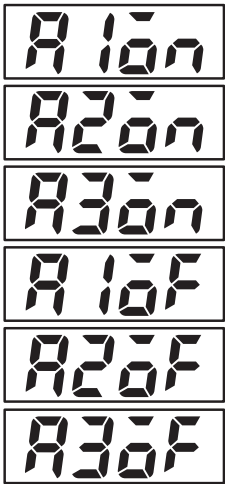
Alarm value 1

4. Select “alarm value 1” by pressing ↺ .



5. Press the ^^ key to set the parameter to “10”.

3-9-3 Alarm Delays



- Creates a delay between the time the PV value reaches the alarm ON/OFF set point and the time of alarm output. Alarm delay may be set independently for alarms 1, 2, and 3.
- This level is under the advanced function setting level. Before changing settings, please verify that the protection function has been disabled.

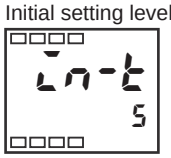
Operation Procedure

Set alarm 1 ON delay to "10 seconds". Relevant parameters and settings are given below. In this example, alarm output will begin after a "10 second" delay.

“alarm 1 ON delay” = “10”

1,2,3...

Initial setting level



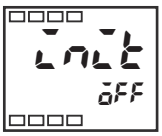
Input level

1. Press the ◯ key for at least 3 seconds, switching from the "operation level" to the "initial setting level".

2. Press the ↩ key to select the "advanced function setting level". Switch to the advanced function setting level.

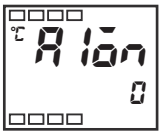
3. Use the ∧ ∨ keys to set the parameter to "–169".Enter the advanced function setting level.

Advanced function setting level

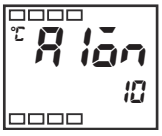


Switch to advanced function setting level

4. To set "alarm1 ON delay" press the ↩ key and select the "alarm 1 ON delay" parameter.



Alarm 1 ON delay

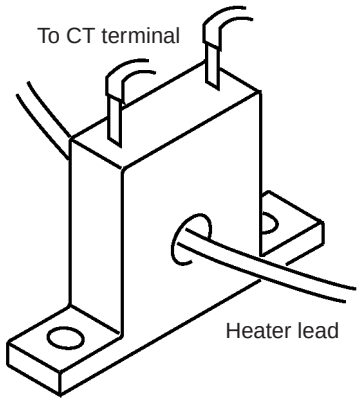


5. Use the ∧ ∨ key to set 10 second (delay).

3-10 Using Heater Burnout Alarm (HBA)

3-10-1 HBA Detection

- Heater burnout detection works as follows.



1,2,3...

1. Connect the current transformer (CT) to terminals 15 and 16, and insert the heater lead through the CT hole. For specifications, models and external dimensions of current transformers that can be used on this controller, refer to *Current Transformer (CT)* in Appendix.
2. When current flows through this lead, the current transformer generates AC current proportional to the current value. The E5AZ/E5EZ measures this AC current to calculate the current flowing to the heater.
3. If the heater is burned out, the measured current decreases and falls below the heater burnout detection value. The output is then activated as the heater burnout alarm.

- Set the heater burnout set value in the “heater burnout detection” parameter (adjustment level). To monitor the current value of the current transformer, use the “heater current monitor” parameter.
- When you are not using the HBA function, set the “heater burnout” parameter (advanced function setting level) to “OFF”.
- For models with HBA, an OR output is established between the ALM 1 function and the HBA. If the ALM1 function is to be used for HBA only, set 0 as the ALM1 type and do not use ALM1.

3-10-2 Operating Conditions

- The HBA function can be used when the option unit (E53-AZH) is mounted on the E5AZ/E5EZ. Be sure to connect the CT to the E5AZ/E5EZ, and pass the heater lead through the CT hole.
- Turn the heater ON at the same time as or before turning the E5AZ/E5EZ ON. If the heater is turned ON after turning the E5AZ/E5EZ ON, the heater burnout alarm will activate.
- Control is continued even if the heater burnout alarm is active. (That is, the E5AZ/E5EZ attempts to control the heater on which the heater burnout alarm has not occurred.)
- The heater burnout alarm is detected when the control output is continuously ON for 190 ms or more.
- The rated current value may sometimes differ slightly from the actual current flowing to the heater. Check the current value in an actual operating state in the “heater current monitor” parameter.
- If there is little difference between the current in a normal state and the current in the burnout state, detection may become unstable. On a heater of current 10.0 A or less, maintain a difference of 1.0 A or more. On a heater of current 10.0 A or more, maintain a difference of 2.5 A or more.
- The HBA function cannot be used when the heater is controlled by a phase control system or cycle control system. Also, 3-phase heaters cannot be used.

When heater burnout is detected on a 3-phase heater, use the K2CU-F□□A-□GS (with gate input terminal). See the respective datasheet for details.

3-10-3 Setup

To activate the heater burnout alarm, set the "HB ON/OFF" parameter (advanced function setting level) to "ON" and the heater burnout set value in the "heater burnout detection" parameter (adjustment level).

In this example, let's set the "heater burnout detection" parameter to "2.5".

Operation Procedure

Moving to the advanced function setting level

The default of the "heater burnout" parameter is already "ON", so set the "heater burnout detection" parameter.

1,2,3...

1. Move to the advanced function setting level.
   Press the ◯ key for at least three seconds to move from the "operation level" to the "initial setting level".

Operation level

PV/SP

Initial setting level

Input type

2. Then move to "advanced function setting level" by pressing the ↩ key.

3. Press the ≫ key to enter the password ("−169"), and move from the "initial setting level" to the "advanced function setting level".

Advanced function setting level

Move to advanced function setting level

The top parameter in the "advanced function setting level" is displayed.

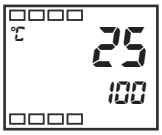
HB ON/OFF

4. Select the "HB ON/OFF" parameter by pressing the ↩ key.
   Make sure that this parameter is set to "ON" (default).

   Next, let's set the "heater current value monitor" parameter.

Setting heater burnout detection

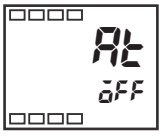
Operation level



PV/SP

5. Press the ◯ key for at least one second to move from the “advanced function setting level” to the “initial setting level” and then to the “operation level”.

Adjustment level

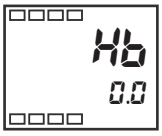


AT execute/ cancel

6. Press the ◯ key for less than one second to move from the “operation level” to the “adjustment level”.

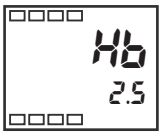
Heater current value monitor

7. Select the “heater current value monitor” parameter by pressing the ↩ key. Check the current value. Next, set the “heater burnout detection” parameter.



Heater burnout detection

8. Select the “heater burnout detection” parameter by pressing the ↩ key. Set the current value as a reference value. Set this set value so that there is a large difference between the current flowing to the heater lead when heater operation is normal and the current flowing when a heater burnout occurs.



9. For example, set “2.5”. To return to the “operation level”, press the ◯ key for less than one second.

3-10-4 Calculating Detection Current Values

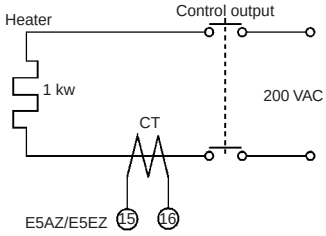
- Calculate the set value by the following equation:

$$\text{Set value} = \frac{(\text{current value at normal operation} + \text{current value at heater burnout})}{2}$$

- To set the current for heater burnout when two or more heaters are connected through the CT, use the value from when the heater with the smallest current burns out. If all of the heaters have the same current, use the value from when any one of them burns out.
- Make sure that the following conditions are satisfied:
  Heater with a current of less than 10.0 A:
  (Current value at normal operation) – (Current value at heater burnout) ≥ 1 A
  When the difference is less than 1 A, detection is unstable.
  Heater with a current of 10.0 A or more:
  (Current value at normal operation) – (Current value at heater burnout) ≥ 2.5 A
  When the difference is less than 2.5 A, detection is unstable.
- The setting range is 0.1 to 49.9 A. Heater burnout is not detected when the set value is "0.0" or "50.0". When the set value is "0.0", the heater burnout alarm is set to "OFF", and if the set value is "50.0", the heater burnout alarm is set to "ON".
- Set the total current value at normal heater operation to 50 A or less. When set to "55.0 A", "FFFF" is displayed in the "heater current monitor" parameter.

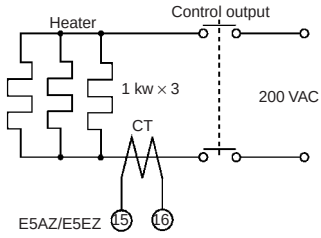
3-10-5 Application Examples

Example 1 When using a 200 VAC, 1 kW heater



Current during normal operation = $\frac{1000}{200}$ = 5 A (< 10 A)
Current at heater burnout = 0 A
Set value = $\frac{5 + 0}{2}$ = 2.5 A
(current at normal operation – current at heater burnout) = 5 – 0 = 5 A (≥ 1 A))

Example 2 When using three 200 VAC, 1 kW heaters



Current at normal operation = $\frac{1000}{200} \times 3$ = 15 A (≥ 10 A)
Current at burnout of one heater = $\frac{1000}{200} \times 2$ = 10 A
Set value = $\frac{15 + 10}{2}$ = 12.5 A
(current at normal operation – current at heater burnout) = 15–10 = 5 A (≥ 2.5 A))

Parameters

Symbol	Parameter: Level	Description
CLt	Heater current value monitor: Adjustment level	For heater current value monitor
Hb	Heater burnout detection: Adjustment level	For HBA detection
HbH	Heater burnout hysteresis: Advanced function setting level	For HBA detection
HbL	Heater burnout latch: Advanced function setting level	For HBA detection

3-11 Requests during Operation

1,2,3...

1. About four seconds is required for outputs to turn ON when the power is turned ON. Take this into consideration when the temperature controller is incorporated into a sequence circuit.
2. Allow at least 30 minutes for warming up.
3. When self-tuning is used, turn the temperature controller and load (e.g. heater) ON simultaneously or turn the load ON before the temperature controller. If the load is turned ON after the temperature controller, correct self-tuning and optimum control are no longer possible.
   When operation is started after warm-up, turn the power OFF once after warm-up is completed, and then turn the temperature controller and load ON simultaneously. (Instead of turning the temperature controller power ON again, moving from the STOP to the RUN mode also is possible.)
4. The temperature controller may be subject to the influence of radio interference if used near a radio, TV or wireless equipment.

SECTION 4
Applications Operations

This section describes scaling, the SP ramp function, and other special functions that can be used to make the most of the functionality of the E5AZ/E5EZ Digital Temperature Controllers.

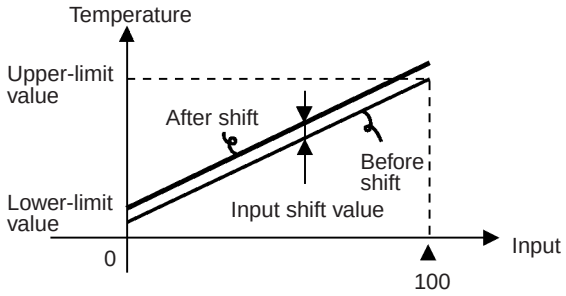
4-1 Shifting Input Values

4-1-1 Shifting Inputs

- The input shift type matched to the sensor currently selected in the “input type” parameter is displayed.

One-point shift

- Two-point shift is applied only for infrared temperature sensors.
- With one-point shift, only the value set to the “Temperature input shift” parameter (adjustment level) is applied to the entire temperature input range. For example, if the input shift value is set to “1.2°C”, the process value is treated as “201.2°C” after input shift is applied when the process value is 200°C.

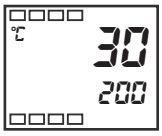


Operation Procedure

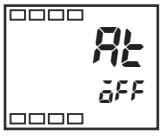
In this example, let’s shift the input of the K sensor by “1°C” by one-point input shift.

Operation level

Operation level

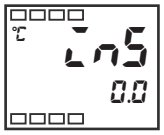


Adjustment level



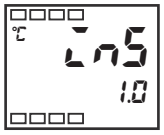
1,2,3...

1. Press the ◯ key to move from the “operation level” to the “adjustment level”.



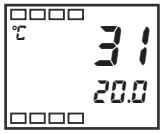
Temperature input shift

2. Select the “temperature input shift” parameter by pressing the ↩ key.



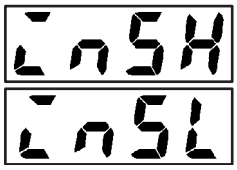
3. Press the ∧ or ∨ key to set “1.0”.

Operation level



4. To return to the “operation level,” press the ◯ key. The process value is 1°C larger than before shift is applied.

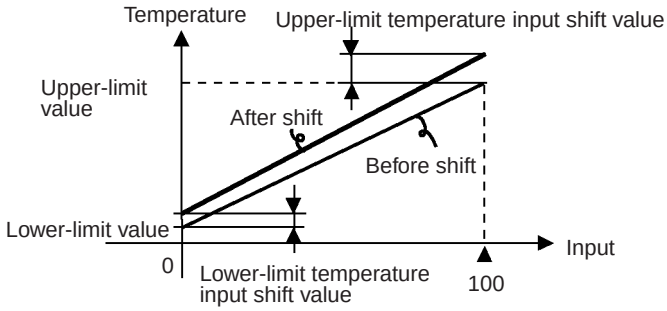
Two-point shift



Upper-limit temperature input shift value

Lower-limit temperature input shift value

- Separate shift values can be set for the upper limit and lower limit of the sensor input range for an infrared sensor. If different shift values are set for the upper limit and lower limit, then the slope of the line will be different before and after applying the input shift. For example, if the upper-limit value is set to 2°C and the lower-limit value is set to 1°C, the input temperature will be shifted by 1.5°C for a 50% input, i.e., by the average of the upper-limit and lower-limit values.
- Set the upper-limit value in the “upper-limit temperature input shift value” parameter and the lower-limit value in the “lower-limit temperature input shift value” parameter.



4-1-2 How to Calculate Input Shift Values for a Two-point Shift

When the infrared temperature sensor model ES1B is connected to the E5AZ/E5EZ, an offset of several degrees to several tens of a degree can occur.

For this reason, offset the readout value by one-point or two-point shift as described in this item. This offset occurs as a bias current for detecting controller sensor error flows to the output impedance of the infrared temperature sensor. Two-point shift can be carried out only on infrared temperature sensors, and cannot be set for other input types.

[Preparations]

1,2,3...

1. Set a temperature range matching the input specifications of the infrared temperature sensor. (ES1B is supported only in thermocouple input types on the E5AZ/E5EZ.)
2. Prepare a thermometer capable of measuring the temperature of the control target as shown in Figure 1 so that one-point shift or two-point shift can be carried out.

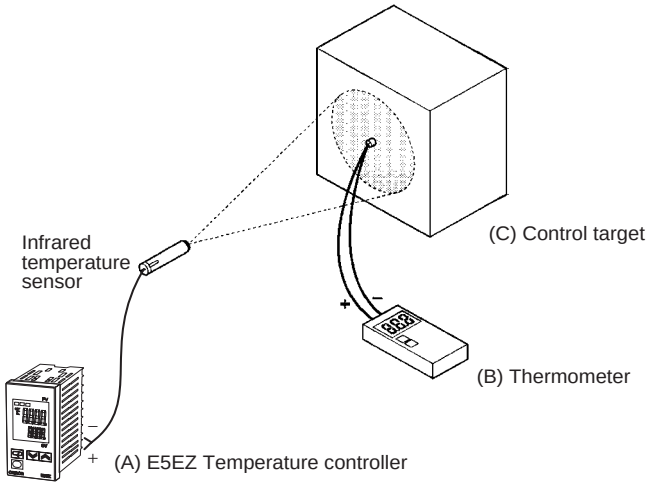


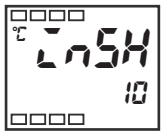
Figure 1 Configuration When Compensating an Infrared Temperature Sensor

4-1-3 One-point Shift Method

1,2,3...

1. In the configuration shown in Figure 1, bring the set point to near the value at which the temperature of the control target is to be controlled. Let's assume that the control target temperature (C) and the control target temperature (B) are matching.

Adjustment level

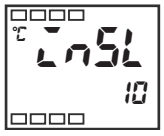


Upper-limit temperature input shift value

2. Check the control target temperature (B) and the controller readout (A). Take the following value as the input shift value, and set the same numerical values to "inSL" and "inSH".

control target temperature (B) - controller readout (A)

Figure 2 shows the effect of one-point temperature input shift.



Lower-limit temperature input shift value

3. After you have set the input shift values, check controller readout (A) and control target temperature (B). If they are almost the same, this completes temperature input shift.

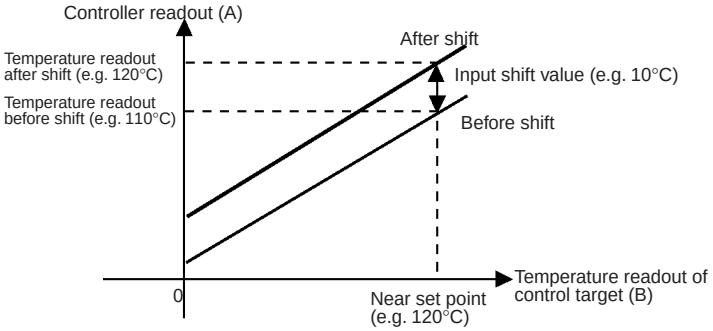


Figure 2 One-point Temperature Input Shift

4-1-4 Two-point Shift Method

Use two-point input shift if you want to increase the accuracy of the readout values across the range of the sensor.

1,2,3...

1. Shift the controller readout by two points, near room temperature and near the value at which the temperature of the control target is to be controlled. For this reason, bring the control target temperature to near room temperature and to near the set point, and check control target temperature (B) and controller readout (A).

2. Using equations (1) and (2) calculate the upper- and lower-limit temperature input shift values from the readout and temperature to be shifted that you obtained in step 1.
   Figure 3 shows the effect of shift by two-point temperature input shift.

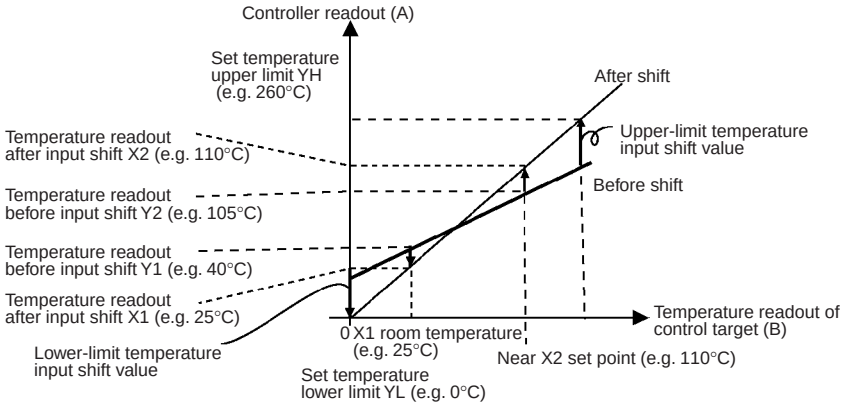


Figure 3 Two-point Temperature Input Shift

- Use the following equation to calculate the lower-limit temperature input shift value.

$$\text{InSL} = \frac{YL - Y1}{Y2 - Y1} \times \{(X2 - Y2) - (X1 - Y1)\} + (X1 - Y1) \text{...equation 1}$$

- Use the following equation to calculate the upper-limit temperature input shift value.

$$\text{InSH} = \frac{YH - Y1}{Y2 - Y1} \times \{(X2 - Y2) - (X1 - Y1)\} + (X1 - Y1) \text{...equation 2}$$

3. After you have set the calculated values to "InSL" and "InSH", check controller readout (A) and control target temperature (B).
4. Although the input shift was carried out at two points, close to room temperature (ambient temperature), and near to the set point, select points close to each end of the sensor range to improve accuracy across the full range of the sensor measurement range.

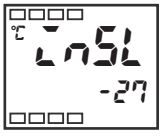
   Note Before selecting these values, check that they will not damage the controller if applied.

4-1-5 Example of Two-point Temperature Input Shift

In this example, we use the ES1B K 0 to 260°C specification. In equations 1 and 2, the set temperature lower limit YL is 0°C and the set temperature upper limit YH is 260°C. Check the temperature of the control target.

The temperature input offset values can be calculated as shown below when the Controller readout Y1 is 40°C for a room temperature X1 of 25°C and when the Controller readout Y2 is 105°C for a set point temperature X2 of 110°C.

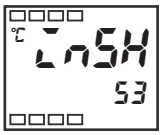
Adjustment level



Lower-limit temperature input shift value

Lower-limit temperature input shift value

$$\text{InSL} = \frac{0 - 40}{105 - 40} \times \{(110 - 105) - (25 - 40)\} + (25 - 40) = -27.3\ (°C)$$



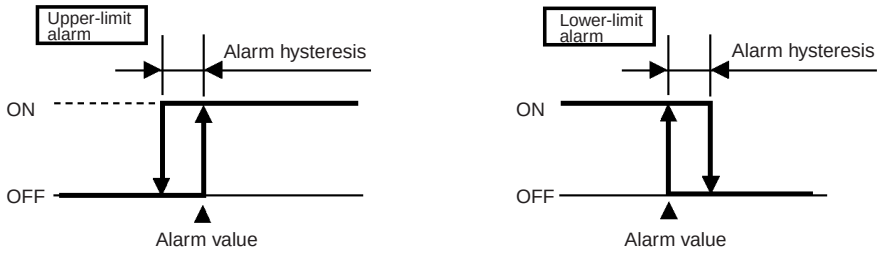
Upper-limit temperature input shift value

Upper-limit temperature input shift value

$$\text{InSH} = \frac{260 - 40}{105 - 40} \times \{(110 - 105) - (25 - 40)\} + (25 - 40) = 52.7\ (°C)$$

4-2 Alarm Hysteresis

- The hysteresis of alarm outputs when alarms are switched ON/OFF can be set as follows:



- Alarm hysteresis is set independently for each alarm in the “alarm hysteresis 1”, “alarm hysteresis 2” and “alarm hysteresis 3” parameters (advanced function setting level). Default is “0.2”.

4-2-1 Standby Sequence

- “Standby sequence” is a function which allows the alarm outputs to be temporarily disabled while the first alarm condition occurs. From here on, the alarm output is active for future alarm conditions.
- For example, with a lower limit alarm, the process value will normally be below the set point, i.e., within the alarm range, when the power supply is turned ON, causing an alarm to be output.
  If the lower limit alarm with a standby sequence is selected, an alarm will not be output until the process value increases above the alarm set value, i.e., until it leaves the alarm range, and then falls back below the alarm set value.

Restart

- The standby sequence is canceled when an alarm is output. It is, however, restarted later by the “standby sequence reset” parameter (advanced function setting level).
  For details, see the “standby sequence reset” parameter in *Section 5 Parameters*.

4-2-2 Alarm Latch

- The alarm latch can be used to keep the alarm output ON regardless of the temperature once the alarm output has turned ON. The alarm output will turn OFF when the power is turned OFF.
- (The alarm output can also be turned OFF by switching to the initial setting level, communications setting level, or advanced function setting level.)

4-2-3 Close in Alarm/Open in Alarm

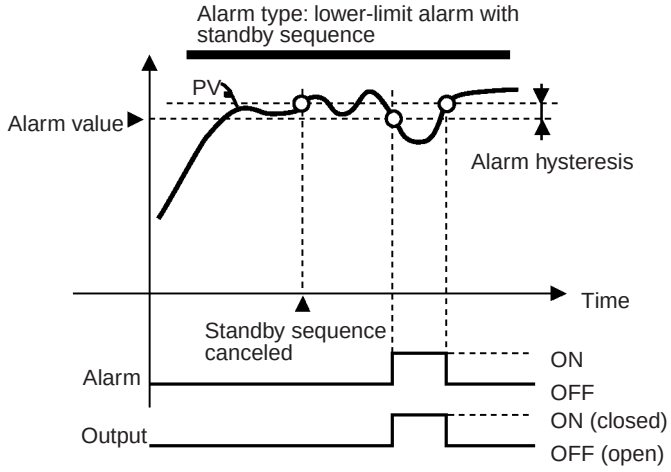
- When the E5AZ/E5EZ is set to “close in alarm,” the status of the alarm output is normally open. When set to “open in alarm,” the status of the alarm output is output inverted or normally closed.
- Alarm type and close in alarm (normally open)/open in alarm (normally closed) can be set independently for each alarm.
- Close in alarm/open in alarm is set in the “alarm 1 to 3 open in alarm” parameters (advanced function setting level). Default is “n-o: close in alarm”.

	Alarm Output Function	Output	Alarm LCD
Close in alarm	ON	ON	Lit
	OFF	OFF	Out
Open in alarm	ON	OFF	Lit
	OFF	ON	Out

- Alarm output turns OFF (relay contact open) at a power interruption and for about two seconds after the power is turned ON regardless of the close in alarm/open in alarm setting

Summary of alarm operations

The figure below visually summarizes the above description of alarm operations (when alarm type is set to “lower-limit alarm with standby sequence” and E5AZ/E5EZ is set to “close in alarm”).

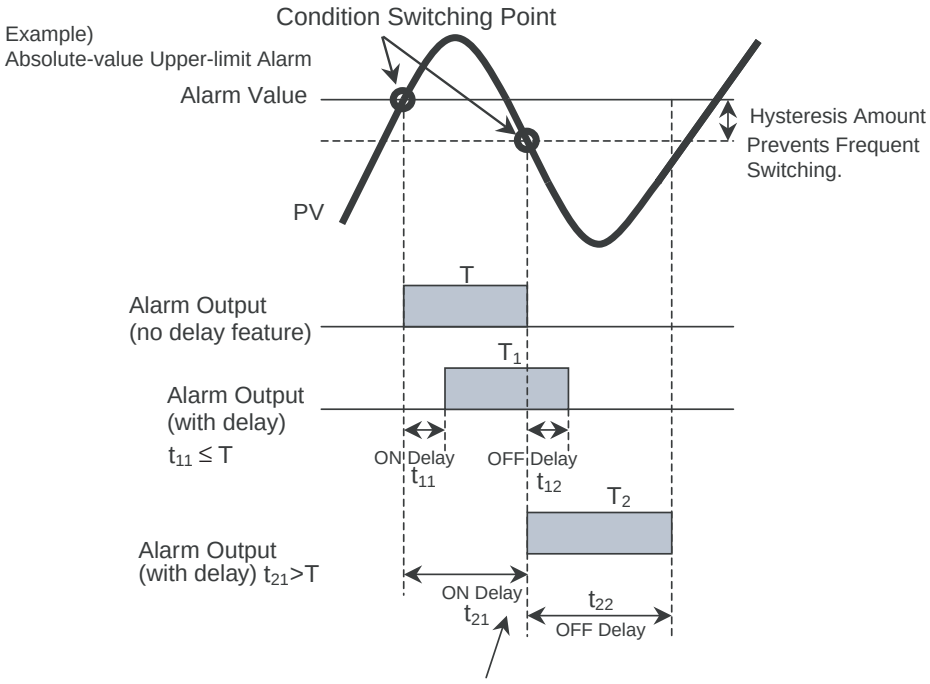


When “alarm 1 open in alarm” (advanced function setting level) is set to “open in alarm”, the heater burnout alarm and input error output also become “open in alarm.”

4-2-4 Alarm Delays

- When "alarm type" is not set to "0: alarm function OFF", then alarm ON/OFF delays can be set independently.
- Using the "alarm 1 to 3 ON/OFF delay" parameter (advanced function setting level), users can set alarm delay times independently. The default is "0: alarm no delay".

The following figure shows an example of absolute-value upper-limit alarms to illustrate the effect of delay function on alarm output.



Note

1. During a delay, the alarm display and communications status will also be delayed.
2. During a delay, if an alarm ON/OFF status changes, delay will occur again.
3. When power is turned on, or the initial setting level changes to the operation level, the ON delay will be used.
4. All outputs will turn OFF and the OFF delays will not function when moving to the initial setting level or when an alarm is output for a heater burnout error.

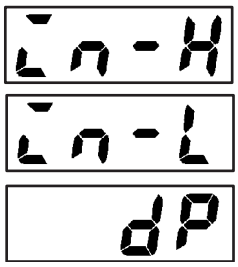
Parameters

Symbol	Parameter Level	Description
AlH□	Alarm 1 to 3 hysteresis: Advanced Function Setting Level	Alarm
rESt	Standby Sequence Reset: Advanced Function Setting Level	Alarm
Al□n	Alarm 1 to 3 Open in Alarm: Advanced Function Setting Level	Alarm
A□on	Alarm 1 to 3 ON delay: Advanced Function Setting Level	Alarm
A□oF	Alarm 1 to 3 OFF delay: Advanced Function Setting Level	Alarm

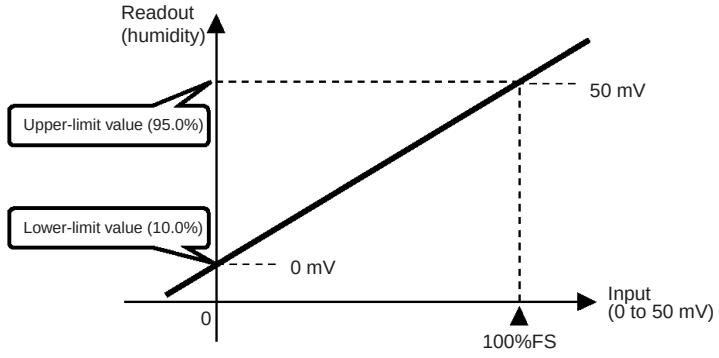
□: 1, 2, or 3

4-3 Setting Scaling Upper and Lower Limits (for Analog Inputs)

4-3-1 Analog Input



- When an analog input (voltage input) is selected, scaling matched to the control is possible.
- Scaling is set in the “scaling upper limit”, “scaling lower limit” and “decimal point” parameters (initial setting level). These parameters cannot be used when temperature input type is selected.
- The “scaling upper limit” parameter sets the physical quantity to be expressed by the upper limit value of input, and the “scaling lower limit” parameter sets the physical quantity to be expressed by the lower-limit value of input. The “decimal point” parameter specifies the number of digits below the decimal point.
- The following figure shows a scaling example of 0 to 50 mV input. After scaling, the humidity can be directly read.

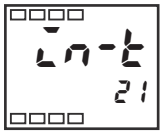


Operation Procedure

In this example, let's set the scaling upper- and lower-limits to display 0 to 50 mV as 10.0% to 95.0%.

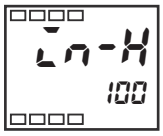
1,2,3...

Initial setting level



Input type

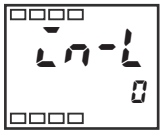
1. Press the ◯ key for at least three seconds to move from the "operation level" to the "initial setting level".



Scaling upper limit

2. Select "scaling upper limit" by pressing ↵ .

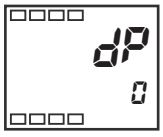
3. Press the ▲▲ or ▼▼ key to set the parameter to "950".



Scaling lower limit

4. Select "scaling lower limit" by pressing ↵ .

5. Press the ▲▲ or ▼▼ key to set the parameter to "100".



Decimal point

6. Select the decimal point position by pressing ↵ .

7. Press the ▲▲ or ▼▼ key to set the parameter to "1".
8. To return to the "operation level" press the ◯ key for at least one second.

4-4 Executing Heating/Cooling Control

4-4-1 Heating/Cooling Control

Heating/cooling control can be used on E5□Z-□3□□ controllers. Heating/cooling control operates when "H-C: heating/cooling" is selected in the "standard or heating/cooling" parameter (initial setting level). Select the standard heating control or cooling control according to the following table:

Setting		Output	
Control Method	**Direct/reverse operation**	**Control output 1**	**Control output 2**
Standard control	Reverse operation	Control output (heat)	-
Standard control	Direct operation	Control output (cool)	-
Heating/cooling control	Reverse operation	Control output (heat)	Control output (cool)
Heating/cooling control	Direct operation	Control output (cool)	Control output (heat)

(Parameter default is heating control (standard).)

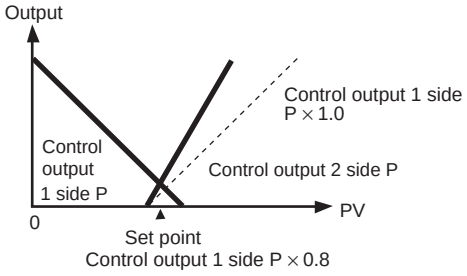
- When heating/cooling control is selected, the "cooling coefficient" and "dead band" parameters can be used.

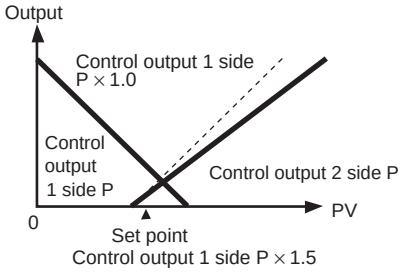
Cooling coefficient

If the heating/cooling characteristics of the control target greatly differ, preventing satisfactory control characteristics from being obtained by the same PID constants, adjust the proportional band (P) at the cooling side using the cooling coefficient to balance control between the heating/cooling sides. In heating/cooling control, P at the heating or cooling side is calculated by the following formula:

Control output 1 side P = P
Control output 2 side P = P × cooling coefficient

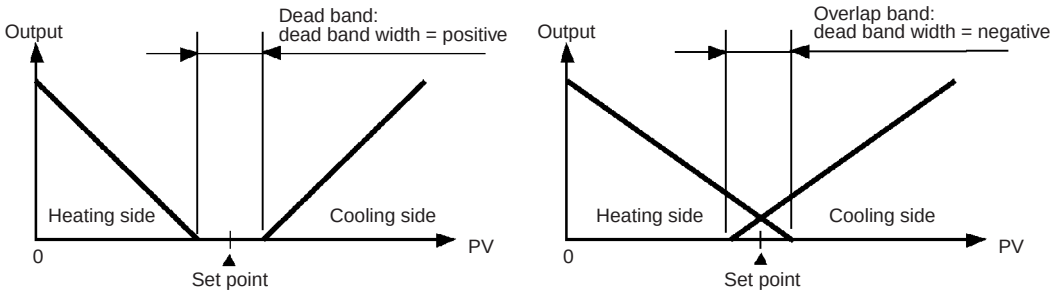
The cooling coefficient is applied to control output 1 side P to obtain control whose characteristics (control output 2 side P) differ from those on the control output 1 side.





Dead band

The dead band is set with the set point as its center on the E5□Z-□3□□.
The dead band width is the set value of the "dead band" parameter (adjustment level). Setting a negative value produces an overlap band.
Default is "0.0EU."



4-4-2 Settings

To set heating/cooling control, set the “standard or heating/cooling”, “cooling coefficient” and “dead band” parameters.

Setting heating/cooling control

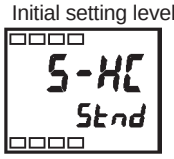
Operation Procedure

“Standard or heating/cooling” = “heating and cooling”

1,2,3...

1. Press the ◯ key for at least three seconds to move from the “operation level” to the “initial setting level”.
2. Select “heating/cooling control” in the “initial setting level”.
   - Stnd: Standard control
   - H-C: Heating/cooling control

Initial setting level



Standard/ heating and cooling

Setting cooling coefficient

Operation Procedure

Cooling coefficient = 10

1,2,3...

1. Select “cooling coefficient” in the “adjustment level”. In this example, set the parameter to “10”.

Adjustment level

Cooling coefficient

2. Press the ⩓ or ⩔ key to set the parameter to “10.00”. The setting range is 0.01 to 99.99.

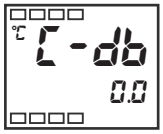
Setting dead band

Operation Procedure

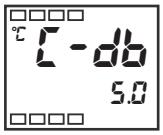
"dead band" = "5"

1,2,3... 1. Select "dead band" in the "adjustment level".

Adjustment level



Dead band



2. Press the ▲▲ or ▼▼ key to set the parameter to "5.0".
The setting range is –199.9 to 999.9.

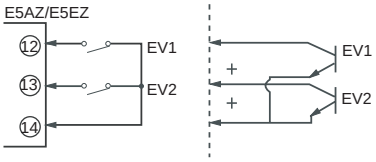
4-5 Using Event Inputs

4-5-1 Event Input Settings

- By event input, either of multi-SP or RUN/STOP can be selected for use.
- Of these, the multi-SP function, event input is used only for the number (0 to 2) set in number of multi-SP uses" (advanced function setting level).
- Event inputs (1 and 2) that are not used for the multi-SP function are assigned using the "event input assignment 1" and "event input assignment 2" parameters (advanced function setting level).
- When an option unit (E53-AZB) is mounted on the E5AZ/E5EZ, the functions listed in the following table can be used.

Number of Multi-SP Uses	Setting		Event Input Function	
	Event input assignment 1	Event input assignment 2	Event input 1 function	Event input 2 function
0	NONE or STOP (See note.)		NONE or RUN/STOP switching (See note.)	
1	– (not displayed)	NONE or STOP	Multi–SP 2 set points (set point 0/1 switching)	NONE or RUN/STOP switching
2	– (not displayed)		Multi–SP 4 set points (set point 0/1/2/3 switching)	

Note "STOP (RUN/STOP) switching" can be set only on one of event input assignments 1 or 2. The event input on the side that is set can be used. The setting on the other side becomes "NONE".



When you are setting two external input set points, set in the "number of multi-SP uses" parameter.

- Switching is possible between two set points (0 and 1) by setting the "number of multi-SP uses" parameter to 1. The default setting is 1 and does not need to be changed to switch between two set points. Set point 0 or 1 is specified by the ON/OFF state of event input 1.

4-5-2 How to Use the Multi-SP Function

With multi-SP, preset four set points (SP 0 to 3) in the adjustment level, a switch the set point either by operating the keys or by external input signals (event input).

When multi-SP is used by event input

Multi-SP can be used when the option event input unit E53-AZB is mounted on the E5AZ/E5EZ and "number of multi-SP uses" is set to "1" or "2".

- When "number of multi-SP uses" is set to "1"

Event input 1	Selected Set Point
OFF	Set point 0
ON	Set point 1

- When "number of multi-SP uses" is set to "2"

Event input 1	Event input 2	Selected Set Point
OFF	OFF	Set point 0
ON	OFF	Set point 1
OFF	ON	Set point 2
ON	ON	Set point 3

Note Event input can be used when the option event input unit E53-AZB is mounted in the E5AZ/E5EZ. Select event input ON/OFF while the E5AZ/E5EZ is turned ON. Judgment of event input ON/OFF is carried out on event inputs of 50 ms or more.

4-5-3 Settings by Key Operation

You can select set points 0 to 3 by changing the set value of the "multi-SP" parameter. The "multi-SP" display conditions are as follows:

- When the option event input unit E53-AZB is not mounted in the E5AZ/E5EZ, and "multi-SP" is set to "ON"
- When the option event input unit E53-AZB is mounted in the E5AZ/E5EZ, the "number of multi-SP uses" is set to "0" and "multi-SP" is set to "ON"

The following table shows the relationship between the "multi SP" parameter set value and the selected set point.

Multi-SP	Selected Set Point
0	Set point 0
1	Set point 1
2	Set point 2
3	Set point 3

4-5-4 Settings

To select set points (0/1/2/3)

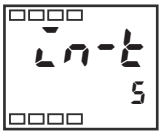
Operation Procedure

Before you set the "number of multi SP uses," cancel protection and move to the "advanced function setting level". For details on how to cancel protection, refer to *4-9 Using the Key Protect Level*.

Operation level

PV/SP

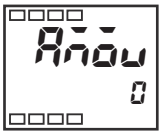
Initial setting level



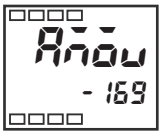
Input type

1,2,3...

1. Press the ◯ key for at least three seconds to move from the “operation level” to the “initial setting level”.



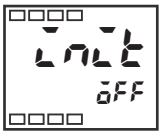
2. Select “Move to advanced function setting level” by pressing the ↺ key.



Move to advanced function setting level

3. Press the ∧ or ∨ key to enter “–169” (password).

Advanced function setting level



Parameter initialization

You can move to the “advanced function setting level” by pressing the ↺ key or leaving the setting for at least two seconds.

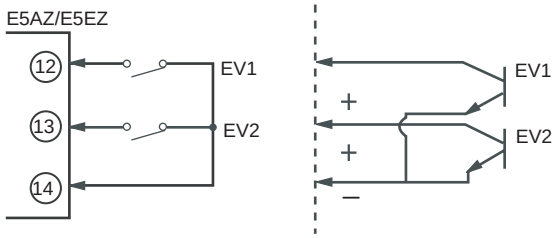
Number of multi-SP uses setting

Number of multi-SP uses

4. Select “Number of multi-SP uses” by pressing the ↺ key.

5. Press the ∧ or ∨ key to set the parameter to “2”.
6. To return to the “initial setting level”, press the ◯ key for at least one second.
7. To return to the “operation level”, press the ◯ key for at least one second.

Set points 0, 1, 2 and 3 are set according to the ON/OFF states of event inputs 1 and 2.



4-5-5 Executing Run/Stop Control

When “event input assignment 1” or “event input assignment 2” is set to “run/stop”, control started when event input 1 or 2 becomes “OFF”. Control is stopped when event input 1 or 2 becomes “ON”. However, alarm output will be ON according to alarm setting.
While control is stopped, STP (stop) lights.

Setting	Input Contact	State
Event input 1 or 2	ON	STOP
Event input 1 or 2	OFF	RUN

Note When “number of multi-SP uses” is set to “0” or “1” that is not the set point setting, run/stop control is possible according to event inputs.

Event input assignments 1 and 2 are as follows according to the “number of multi-SP uses” setting.

Number of Multi-SP Uses	Setting		Event Input Function	
	Event input assignment 1	Event input assignment 2	Event input 1 function	Event input 2 function
0	NONE	STOP	NONE	RUN/STOP switching
	STOP	NONE	RUN/STOP switching	NONE
	NONE	NONE	NONE	NONE
1	– (setting data not displayed)	STOP	Multi–SP 2 set points (set point 0/1 switching)	RUN/STOP switching
	– (setting data not displayed)	NONE	Multi–SP 2 set points (set point 0/1 switching)	NONE or RUN/STOP switching
2	– (setting data not displayed)	– (setting data not displayed)	Multi–SP 4 set points (set point 0/1/2/3 switching)	

- When the number of multi-SP uses is set to either 1 or 2, and event input assignment 1 or 2 is set to “not displayed,” the setting automatically becomes “none.”
- When the “number of multi-SP uses” is set to “0”, and both input assignments 1 and 2 can be set, RUN/STOP is assigned to only one event assignment. The other event assignment is automatically set to OFF.
- When the RUN/STOP function is used for event inputs, RUN/STOP at the run level is not displayed.

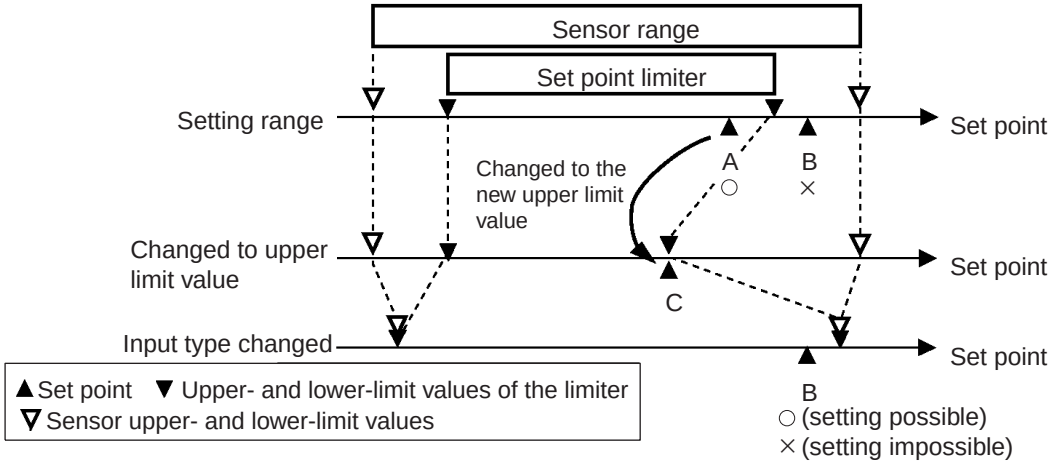
Parameters

Symbol	Parameters: Level	Description
Eu-1	Event input 1 assignment: Advanced function setting level	For event input function
Eu-2	Event input 2 assignment: Advanced function setting level	
Eu-n	Number of multi-SP uses: Advanced function setting level	

4-6 Setting the SP Upper- and Lower-Limit Values

4-6-1 Set Point Limiter

The setting range of the set point is limited by the set point limiter. The set point limiter is used to prevent the control target from reaching abnormal temperatures. The upper- and lower-limit values of this set point limiter are set by the “set point upper limit” and “set point lower limit” parameters in the “initial setting level”, respectively. However, note that when the set point limiter is reset, the set point is forcibly changed to the upper- or lower-limit value of the set point limiter if the set point is out of the limiter range. Also, when the input type and temperature unit are changed, the set point limiter is forcibly reset to the sensor setting range.

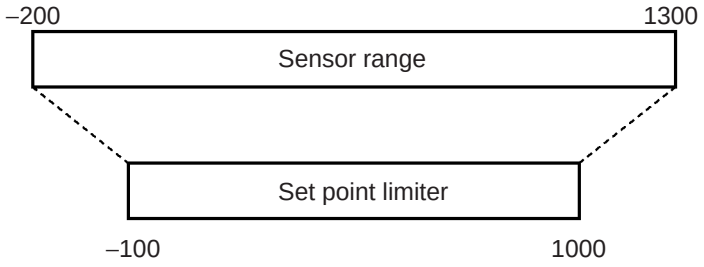


Parameters

Symbol	Parameters: Level	Description
SL-H	Set point upper limit: Initial setting level	For limiting SP setting
SL-L	Set point lower limit: Initial setting level	For limiting SP setting

4-6-2 Setting

To set the set point upper and lower limits, set in the “set point upper limit” and “set point lower limit” parameters in the “initial setting level”. This example describes how to set the set point limiter “–200 to 1300°C” to input type K thermocouple.



Setting the set point upper limit

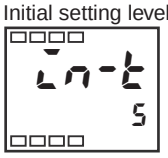
Operation Procedure

Set the “set point upper limit” parameter to “1000”.

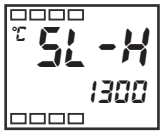
1,2,3...

1. Press the ◯ key for at least three seconds to move from the “operation level” to the “initial setting level”.

Initial setting level

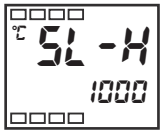


Input type



Set point upper limit

2. Select “set point upper limit”.



3. Press the ∧ or ∨ key to set the parameter to “1000”.

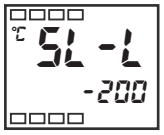
Setting the set point lower limit

Operation Procedure

Set the “set point lower limit” parameter to “–100”.

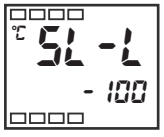
1,2,3...

1. Select “set point lower limit” in the “initial setting level”.



Set point lower limit

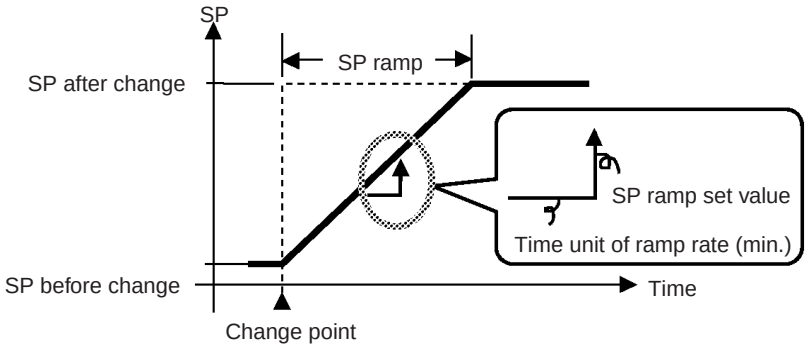
2. Press the ∧ or ∨ key to set the parameter to “–100”.



4-7 Using the SP Ramp Function (to Limit the SP Change Rate)

4-7-1 SP Ramp

With the SP ramp function, the controller operates according to the value (set point during SP ramp) limited by a change rate. The interval in which the set point during SP ramp is limited is referred to as the “SP ramp”.



The change rate during SP ramp is specified by the “SP ramp set value” parameter. The “SP ramp set value” default is “OFF”, and the SP ramp function is disabled.

Changing of the ramp set point can be monitored in the “set point during SP ramp” parameter (operation level). Use this parameter during monitoring of the SP ramp.

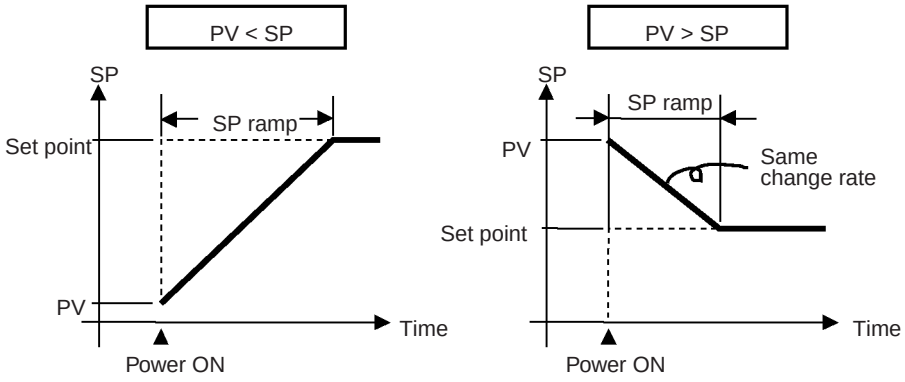
Operation is the same also during switching of the set points by multi-SP.

Parameters

Symbol	Parameters: Level	Description
oL-H	MV upper limit : Advanced function setting level	For limiting manipulated variable
oL-L	MV lower limit: Advanced function setting level	For limiting manipulated variable
SL-H	Set point upper limit: Initial setting level	For limiting SP setting
SL-L	Set point lower limit: Initial setting level	For limiting SP setting
SPrt	SP ramp set value: Advanced function setting level	For limiting SP change rate

Operation at start

If the SP ramp function is enabled when the E5AZ/E5EZ is turned ON, and when “run” is switched to from “stop,” the process value may reach the set point after SP ramp in the same way as when the set point is changed. In this case, operation is carried out with the process value regarded as the set point before the change was made.
The direction of the SP ramp changes according to the relationship between the process value and the set point.



Restrictions during SP ramp operation

- Execution of auto-tuning starts after the end of SP ramp.
- When control is stopped or an error occurs, the SP ramp function is disabled.

4-8 Moving to the Advanced Function Setting Level

In the default setting, the advanced function setting level is protected and you cannot move to this setting level. To move to this setting level, you must first cancel the protection applied by the "protect level." See *4-9 Using the Key Protect Level*.

1,2,3...

1. Press the ◯ and ⏎ keys simultaneously for at least three seconds in the "operation level."

   Note The key pressing time can be changed in "Move to protect level time" (advanced function setting level).

Protect level

"operation/ adjustment protect"

2. The controller moves to the protect level, and "operation/adjustment protect" is displayed.

"initial setting/ communications protect"

3. Press the ⏎ key once to move to "initial setting/communications protect."

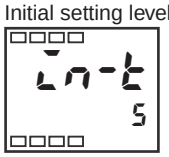
4. Set the set value to "0"

Operation level

PV/SP

5. Press the ◯ and ⏎ keys simultaneously to return to the "operation level."

Initial setting level



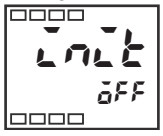
Input type

6. Press the ◯ key for at least three seconds to move to the "initial setting level" from the "operation level."

Move to advanced function setting level

7. Select the "Move to advanced function setting level" parameter by pressing the ⏎ key.

Advanced function setting level



8. Press the ⏶ or ⏷ key to enter the password ("–169"), and either press the ⏎ key or leave the setting for at least two seconds to move to the "advanced function setting level" from the "initial setting level."

4-9 Using the Key Protect Level

4-9-1 Protection

- To move to the protect level, press the ◯ and ↩ keys simultaneously for at least three seconds.
- The protect level protects parameters that are not changed during controller operation until operation is started to prevent them from being modified unintentionally.
- The protect level setting restricts the range of parameters that can be used.

Operation/adjustment protect

The following table shows the relationship between set values and the range of protection.

Level		Set value			
		0	1	2	3
Operation level	PV	◯	◯	◯	◯
	PV/SP	◎	◎	◎	◯
	Other	◎	◎	×	×
Adjustment level		◎	×	×	×

◎ : Can be displayed and changed
◯ : Can be displayed
× : Cannot be displayed and move to other levels not possible

- When this parameter is set to “0”, parameters are not protected.
- Default is “0”.

Initial setting/ communications protect

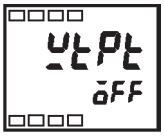
This protect level restricts movement to the initial setting level, communications setting level and advanced function setting level.

Set value	Initial setting level	Communications setting level	Advanced function setting level
0	◯	◯	◯
1	◯	◯	×
2	×	×	×

◯ : Move to other levels possible
× : Move to other levels not possible

- Default is “1”.

Setting change protect



This protect level protects setup from being changed by operating the keys on the front panel.

Set value	Description
OFF	Setup can be changed by key operation.
ON	Setup cannot be changed by key operation. (The protect level can be changed.)

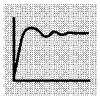
- Default is “OFF”.

SECTION 5
Parameters

This section describes the individual parameters used to setup, control, and monitor operation.

5-1 Conventions Used in This Section

5-1-1 Meanings of Icons Used in This Section


Function

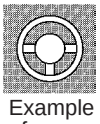
Describes the functions of the parameter.


Setting

Describes the setting range and defaults of the parameter.


Monitor

Describes the monitor range.


Example of use

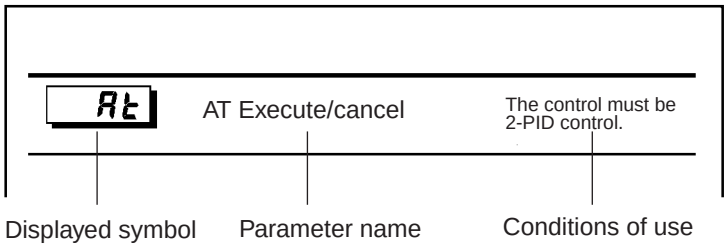
Describes the parameter operations.


See

Describes related parameters and items.

5-1-2 About Related Parameter Displays

Parameters are displayed only when the “Conditions of Use” on the right of the parameter heading are satisfied. However, note that the settings of protected parameters are still valid, and are not displayed regardless of the conditions of use.



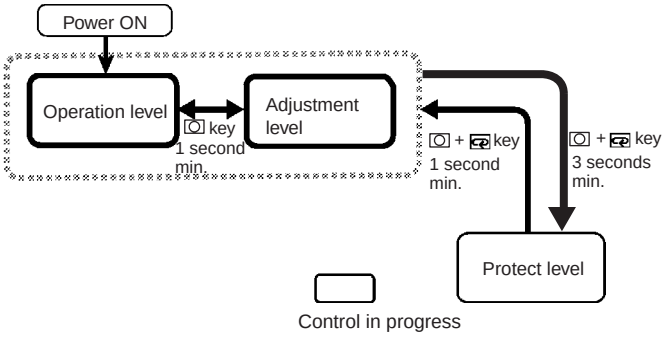
5-1-3 About the Order in Which Parameters Are Described in This Section

Parameters are described level by level.

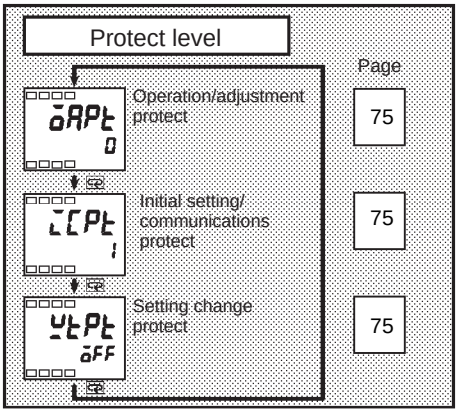
The first page of each level lists the parameters available in that level. The parameter names in this list are listed in the order that they are displayed on the E5AZ/E5EZ.

5-2 Protect Level

Three levels of protection are provided on the E5AZ/E5EZ, “operation/adjustment protect”, “initial setting/communications protect” and “setting change protect.” These protect levels prevent unwanted operation of the keys on the front panel in varying degrees.



To move from the operation Level to the protect level, press the and keys for at least three seconds.



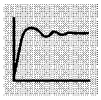
The settings of protected parameters are not displayed and so cannot be modified.

oAPt Operation/adjustment protect

iCPt Initial setting/communications protect

ntPt Setting change protect

This parameter specifies the range of parameters to be protected. ▭ indicates the default.


Function


Setting

■ **Operation/adjustment protect**

The following table shows the relationship between set values and the range of protection.

Level		Set value			
		0	**1**	**2**	**3**
Operation level	**PV**	○	○	○	○
	PV/SP	◎	◎	◎	○
	Other	◎	◎	×	×
Adjustment level		◎	×	×	×

◎ : Can be displayed and changed
○ : Can be displayed
× : Cannot be displayed and moving to other levels is not possible

- Parameter items are not protected when the set value is set to “0”.

■ **Initial setting/communications protect**

Move to the “initial setting level,” “communications setting level” and “advanced function setting level” is restricted.

Set value	Initial setting level	Communications setting level	Advanced function setting level
0	○	○	○
1	○	○	×
2	×	×	×

○ : Movement possible

× : Movement not possible

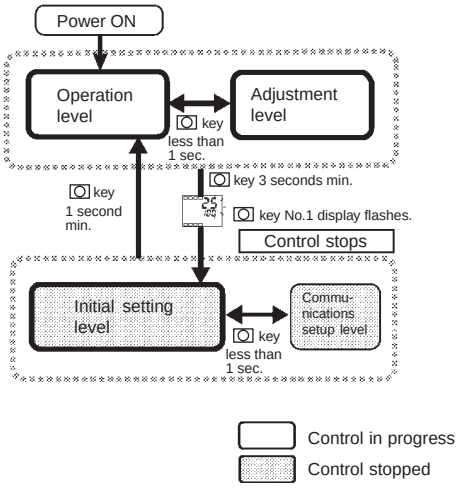
■ **Setting change protect**

Changes to setups by key operation are restricted.

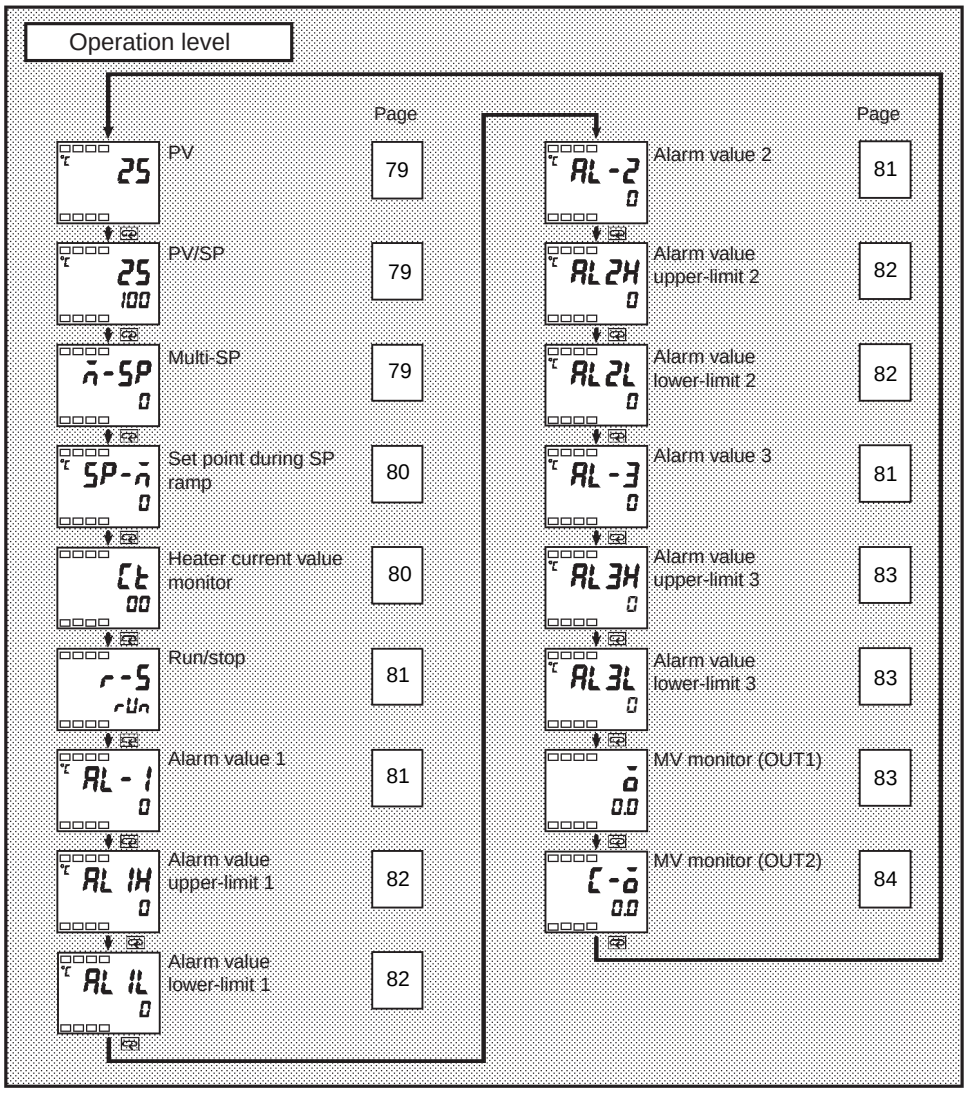
Set value	Description
OFF	Setup can be changed by key operation.
ON	Setup cannot be changed by key operation. (The protect level can be changed.)

5-3 Operation Level

Display this level when you are to carry out control operations on the E5AZ/E5EZ. You can set alarm values or monitor the manipulated variable in this level.

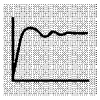


This level is automatically displayed immediately after the E5AZ/E5EZ is turned ON. To move to other levels, press the ◯ key or the ◯ and ⏎ keys.


Operation level
Page
PV
79
PV/SP
79
Multi-SP
79
Set point during SP ramp
80
Heater current value monitor
80
Run/stop
81
Alarm value 1
81
Alarm value upper-limit 1
82
Alarm value lower-limit 1
82
Page
Alarm value 2
81
Alarm value upper-limit 2
82
Alarm value lower-limit 2
82
Alarm value 3
81
Alarm value upper-limit 3
83
Alarm value lower-limit 3
83
MV monitor (OUT1)
83
MV monitor (OUT2)
84

PV

The "additional PV display" parameter must be set to "ON".


Function


Monitor

The process value is displayed on the No.1 display, and nothing is displayed (blank) on the No.2 display.

	Monitor Range	Unit
Process Value	Input indication range (See page 133.)	EU

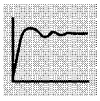
During temperature input, the decimal point position depends on the currently selected sensor, and during analog input, it depends on the "decimal point" parameter setting.


See

■ **Related parameters**

"Input type" (initial setting level)
"Set point upper limit" "Set point lower limit" (initial setting level)

PV/SP


Function


Monitor

The process value is displayed on the No.1 display, and the set point is displayed on the No.2 display.

	Monitor Range	Unit
Process Value	Input indication range (See page 133.)	EU

	Setting Range	Unit
Set Point	Set point lower limit to set point upper limit	EU

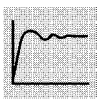
During temperature input, the decimal point position depends on the currently selected sensor, and during analog input, it depends on the "decimal point" parameter setting.

Refer to the PV parameter.


See

Multi-SP (set point 0 to 3)

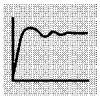
The "multi-SP uses" parameter must be set to "ON".


Function

Multi-SP allows you to set up to four set points (SP 0 to 3) in adjustment level. These can be switched by operating the keys on the front panel or by external input signals (event input). In the parameter, enter set points 0 to 3.

SP-R Set point during SP ramp

The "SP ramp set value" parameter must not be set to "OFF".

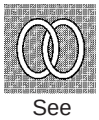

Function

This parameter monitors the set point during SP ramp.

"Ramp" is a function for restricting the change width of the set point as a change rate.
The set value is displayed when "SP ramp set value" parameter (advanced function setting level) is set.
When the set point is out of the preset ramp, the set point is matched to the set point set in the "PV/SP" parameter.


Monitor

Monitor Range	Unit
SP: Set point lower limit to set point upper limit	EU


See

■ **Related parameters**

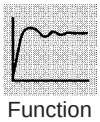
"PV/SP" (operation level)
"SP ramp set value" (advanced function setting level)
"Set point upper limit" "Set point lower limit" (initial setting level)

CT Heater current value monitor

The "heater burnout" parameter must be set to "ON".

This parameter measures the heater current value from the CT input used for detecting heater burnout.

Measures and displays the heater current value.


Function


Monitor

Monitor Range	Unit
0.0 to 55.0	A

- When the current exceeds 55.0 A, "FFFF" is displayed.


See

■ **Related parameter**

"Heater burnout detection" (adjustment level)

r-S Run/Stop

The run/stop function must not be set to event input assignments 1 and 2.

Function

This parameter specifies run and stop.

When "rUn: run" is selected, control is running. When "StoP: stop" is selected, control is stopped. When control is stopped, the STOP display lights.

Default is "rUn".

See

When the run/stop function is being controlled by event input, the run/stop function cannot be set by operating the keys on the front panel.

AL-1 Alarm value 1

AL-2 Alarm value 2

AL-3 Alarm value 3

The alarm type must be set to other than upper- and lower-limit alarm.

The control must be set to standard control. (Alarm value 3 only)

Function

This parameter sets the input value "X" in the alarm type list.

- This parameter is used for setting the alarm values of alarm outputs 1 to 3.
- During temperature input, the decimal point position is dependent on the currently selected sensor, and during analog input, it is dependent on the "decimal point" parameter setting.

Setting

Setting Range	Unit	Default
–1999 to 9999	EU	0

The alarm type must be set to other than upper- and lower-limit alarm.

See

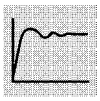
■ **Related parameters**

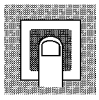
"Input type" "Scaling upper limit" "Scaling lower limit" "Decimal point"
"Alarm 1 type" "Alarm 2 type" "Alarm 3 type" (initial setting level)
"Alarm 1 open in alarm" "Alarm 2 open in alarm" "Alarm 3 open in alarm" "Alarm 1 hysteresis" "Alarm 2 hysteresis" "Alarm 3 hysteresis" "Standby sequence reset", "Alarm 1 to 3 latch" (advanced function setting level)

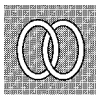
AL 1H **Alarm value upper limit 1**

AL 1L **Alarm value lower limit 1**

Alarm 1 type must be set to upper and lower limits, upper- and lower-limit range, or upper- and lower-limit with standby sequence.


Function


Setting


See

These parameters independently set the alarm value upper and lower limits when the mode for setting the upper and lower limits is selected for alarm 1 type (initial setting level).

- This parameter sets the upper- and lower-limit values of alarm 1.
- During temperature input, the decimal point position is dependent on the currently selected sensor, and during analog input, it is dependent on the "decimal point" parameter setting.

Setting Range	Unit	Default
–1999 to 9999	EU	0

■ **Related parameters**

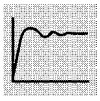
"Input type" "Alarm 1 type" (initial setting level)
"Standby sequence reset" "Alarm 1 open in alarm" "Alarm 1 hysteresis", "Alarm 1 latch" (advanced function setting level)

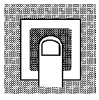
AL2H **Alarm value upper limit 2**

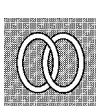
AL2L **Alarm value lower limit 2**

The control must be standard control.

Alarm 2 type must be set to upper and lower limits, upper- and lower-limit range, or upper- and lower-limit alarm with standby sequence.


Function


Setting


See

These parameters independently set the alarm value upper and lower limits when the mode for setting the upper and lower limits is selected for alarm 2 type (initial setting level).

- This parameter sets the upper- and lower-limit values of alarm 2.
- During temperature input, the decimal point position depends on the currently selected sensor, and during analog input it depends on the "decimal point" parameter setting.

Setting Range	Unit	Default
–1999 to 9999	EU	0

■ **Related parameters**

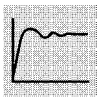
"Input type" "Alarm 2 type" (initial setting level)
"Standby sequence reset" "Alarm 2 open in alarm" "Alarm 2 hysteresis", "Alarm 2 latch" (advanced function setting level)

AL3H **Alarm value upper limit 3**

AL3L **Alarm value lower limit 3**

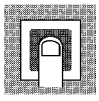
The control must be standard control.

Alarm 3 type must be set to upper and lower limits, upper- and lower-limit range, or upper- and lower-limit alarm with standby sequence.

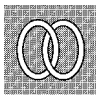

Function

These parameters independently set the alarm value upper and lower limits alarm values when the mode for setting the upper and lower limits is selected for alarm 3 type (initial setting level).

- This parameter sets the upper- and lower-limit values of alarm 3.
- During temperature input, the decimal point position depends on the currently selected sensor, and during analog input it depends on the "decimal point" parameter setting.


Setting

Setting Range	Unit	Default
–1999 to 9999	EU	0

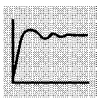

See

■ **Related parameters**

"Input type" "Alarm 3 type" (initial setting level)
"Standby sequence reset" "Alarm 3 open in alarm" "Alarm 3 hysteresis", "Alarm 3 latch" (advanced function setting level)

MV monitor (OUT1)

Manipulated variable display must be set to "ON".

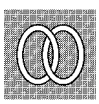

Function

This parameter is for monitoring the manipulated variable on the control output 1 side during operation.

- This parameter cannot be set.
- During standard control, the manipulated variable is monitored, and during control output 1 and cooling control, the manipulated variable on the heating side is monitored.
- Default is "OFF" and the manipulated variable is not displayed.


Monitor

Setting Range	Unit	Default
Standard	0.0 to 100.0	%
Heating/cooling	0.0 to 100.0	%


See

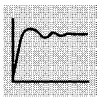
■ **Related parameters**

"Manipulated variable display" (advanced function setting level)

MV monitor (OUT2)

The control must be heating/cooling control.

Manipulated variable display must be set to “ON”.



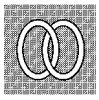
Function

This parameter is for monitoring the manipulated variable on the control output 2 side during operation.

- This parameter cannot be set.
- During heating/cooling control, the manipulated variable on the control output 2 side (“ALM 2” terminal output) is monitored.

Monitor

Setting Range	Unit	Default
Heating/cooling	0.0 to 100.0	%



See

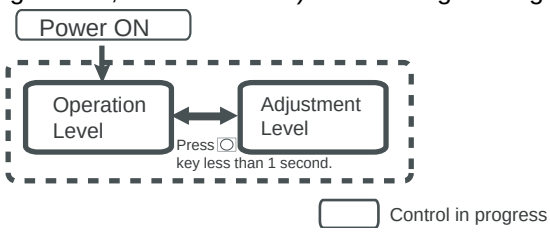
■ **Related parameters**

“Standard or heating/cooling” (initial setting level)
“Manipulated variable display” (advanced function setting level)

5-4 Adjustment Level

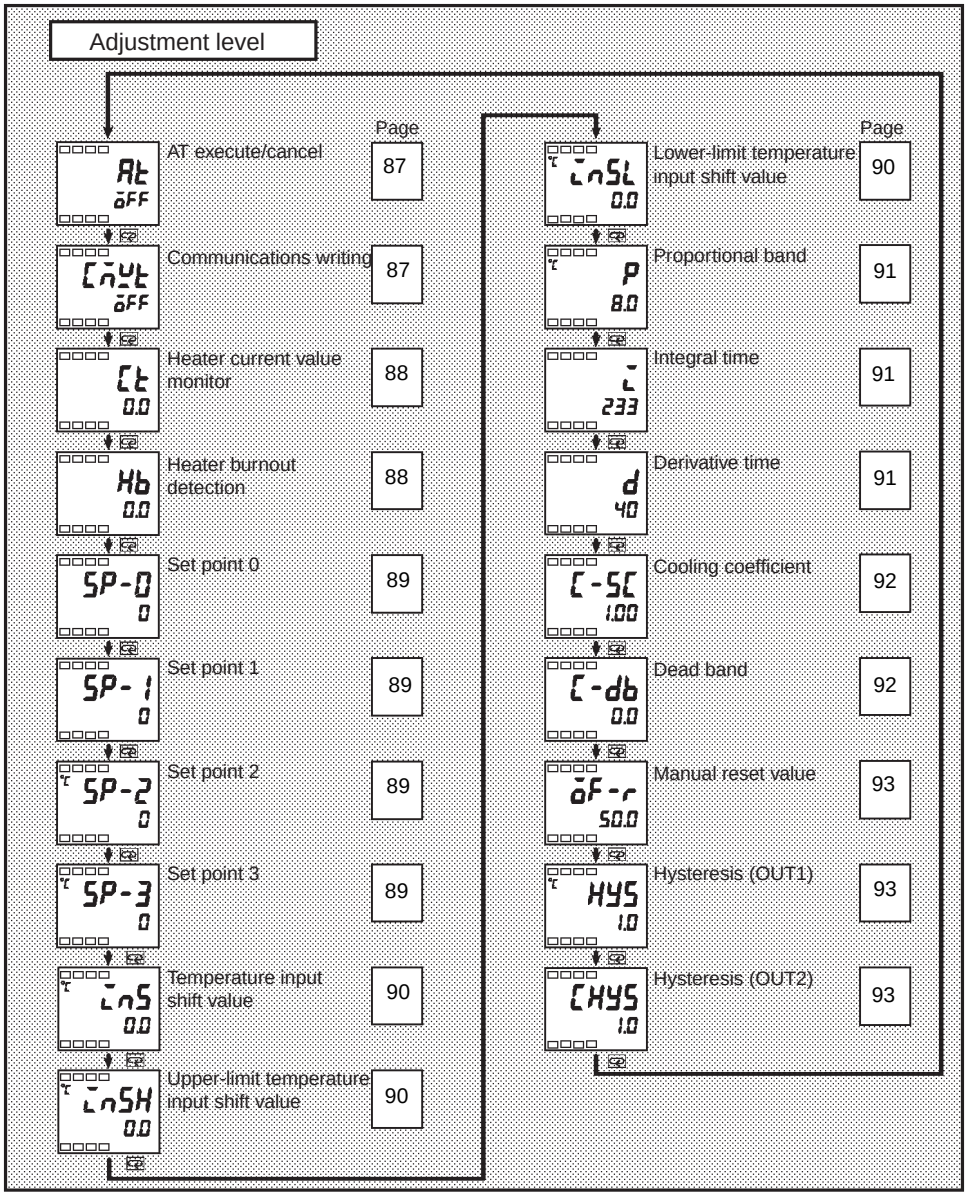
This level is for executing AT (auto-tuning) or setting up the control.

This level provides you with basic controller setup parameters for PID (proportional band, integral time, derivative time) and heating/cooling control.



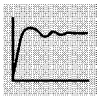
To move to the adjustment level from the operation level, press the ◯ key for less than one second.

- The set points 0 to 3 in the adjustment level are set values for switching the set point during multi-SP input.
- Heater current value monitor and HBA detection are displayed when option unit (E53-AZH) is mounted on the E5AZ/E5EZ.
- You can change adjustment level parameters by setting Operation/adjustment protect to “0”. If the protect level is set to “1” to “3”, adjustment level parameters cannot be displayed.


Adjustment level
Page
AT execute/cancel
87
Communications writing
87
Heater current value monitor
88
Heater burnout detection
88
Set point 0
89
Set point 1
89
Set point 2
89
Set point 3
89
Temperature input shift value
90
Upper-limit temperature input shift value
90
Page
Lower-limit temperature input shift value
90
Proportional band
91
Integral time
91
Derivative time
91
Cooling coefficient
92
Dead band
92
Manual reset value
93
Hysteresis (OUT1)
93
Hysteresis (OUT2)
93

AT execute/cancel

The E5AZ/E5EZ must be in operation, and control must be 2-PID control.

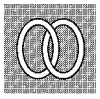

Function

This parameter executes AT (auto-tuning).

- When you execute auto-tuning, the optimum PID parameters “proportional band,” “integral time” and “derivative time” for the set point during program execution are automatically set by forcibly changing the manipulated variable to calculate the characteristics of the control target.


Example of use

- Normally, this parameter is set to “oFF”. If you press the ▲▲ or ▼▼ key, the parameter is turned ON and AT is executed.
- AT cannot be executed when control has stopped or during ON/OFF control.
- When AT execution ends, the parameter setting automatically returns to “oFF”.

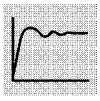

See

■ **Related parameters**

“Proportional band” “Integral time” “Derivative time” (adjustment level)
“PID ON/OFF” (initial setting level)

Communications writing

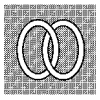
The communications unit (E53-AZ01 or E53-AZ03) must be mounted on the E5AZ/E5EZ.


Function

This parameter enables/disables writing of parameters to the E5AZ/E5EZ from the host (personal computer) by communications.


Setting

ON: Writing enabled
OFF: Writing disabled
Default: OFF


See

■ **Related parameter**

“MB command logic switching” (advanced function setting level) (page 119)

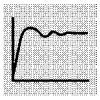
“Communications unit No.” “Baud rate” “Data length” “Stop bits” “Parity” (communications setting level)

CT Heater current value monitor

The “HB ON/OFF” parameter must be set to “ON”.

This parameter measures the current value of the heater from current transformer (CT) input to detect heater burnout.

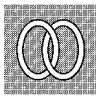
This parameter measures and displays the current value of the heater.


Function


Monitor

Setting Range	Unit
0.0 to 55.0	A

- ”FFFF” is displayed when 55.0 A is exceeded.


See

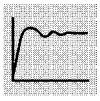
■ **Related parameters**

“Heater burnout detection” (adjustment level)
“HB ON/OFF” (advanced function setting level)

Hb Heater burnout detection

The “HB ON/OFF” parameter must be set to “ON”.

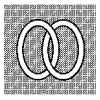
This parameter sets the current value for the heater burnout alarm output to become active.


Function

- This parameter outputs the heater burnout alarm when the heater current value falls below this parameter setting.
- When the set value is “0.0”, the heater burnout alarm is “OFF”. When the set value is “50.0”, the heater burnout alarm is “ON”.


Setting

Setting Range	Unit	Default
0.0 to 50.0	A	0.0


See

■ **Related parameters**

“HB ON/OFF” (advanced function setting level)
“Heater current value monitor” (adjustment level)
“Heater burnout latch” (advanced function setting level)
“Heater burnout hysteresis” (advanced function setting level)

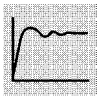
SP-0 **Set point 0**

SP-1 **Set point 1**

SP-2 **Set point 2**

SP-3 **Set point 3**

The “number of multi-SP uses” parameter must be set to either “1” or “2”, and the “multi-SP uses” parameter must be set to “ON”.

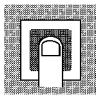

Function

These parameters set the set points when the multi-SP function is used.

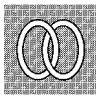
The values set in these parameters can be selected by operating the keys on the front panel or by event input.

- When the set point has been changed, the set value of these parameters currently set by multi-SP is linked and changed.
- During temperature input, the decimal point position is dependent on the selected sensor.

During analog input, the decimal point position is dependent on the setting of the “decimal point position” parameter.


Setting

Setting Range	Unit	Default
Set point lower limit to set point upper limit	EU	0


See

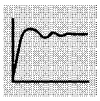
■ **Related parameters**

“Number of multi-SP uses” (advanced function setting level)
“PV/SP” (operation level)
“Input type” (initial setting level)
“Event input assignment 1” (advanced function setting level)
“Event input assignment 2” (advanced function setting level)
“Multi-SP uses” (advanced function setting level)

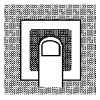
InS Temperature input shift

The "input type" parameter must be set to temperature input excluding an infrared temperature sensor.

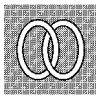
Sometimes an error between the set point and the actual temperature occurs. To offset this, a value obtained by adding an input shift value to the input is displayed as the measurement value and used for control.


Function

The entire input range is shifted by a fixed rate (one-point shift). If the input shift value is set to "–1°C", the set point is controlled to a value obtained by subtracting 1°C from the actual temperature.


Setting

Setting Range	Unit	Default
–199.9 to 999.9	°C or °F	0.0


See

■ **Related parameters**

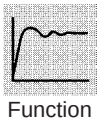
"Input type" (initial setting level)

InSH Upper-limit temperature input shift value

InSL Lower-limit temperature input shift value

The "input type" parameter must be set to only the infrared temperature sensor.

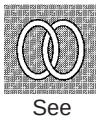
Whereas the entire input range is shifted by a fixed rate (one-point shift) in the "temperature input shift" parameter, the input range is shifted by two points (two-point shift) at the upper and lower limits. Two-point shift enables more accurate offset of the input range compared with one-point shift, if the input shift values at the upper and lower limits differ.


Function

This parameter sets input shift values for each of the upper and lower limits (two-point shift) of the input range.


Setting

Setting Range	Unit	Default
–199.9 to 999.9	°C or °F	0.0


See

■ **Related parameters**

"Input type" (initial setting level)

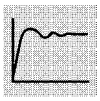
The control must be 2-PID control.

Proportional band

Integral time

Derivative time

This parameter sets the PID parameters. Note that PID is automatically set when AT and ST are executed.

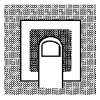


Function

Proportional action: P refers to control in which the MV is proportional to the deviation (control error).

Integral action: I gives a control action that is proportional to the time integral of the control error. With proportional control, there is normally an offset (control error). So, proportional action is used in combination with integral action. As time passes, this control error disappears, and the set point comes to agree with the control temperature (process value).

Derivative action: D gives a control action that is proportional to the time derivative of the control error. As proportional control and integral control correct for errors in the control result, the control system will be late in responding to sudden changes in temperature. Derivative action enables control that is proportional to a predicted process output to correct for future error

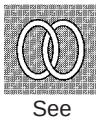


Setting

Parameter	Setting Range	Unit	Default
Proportional band	0.1 to 999.9	EU (See note.)	8.0
Integral time	0 to 3999	Second	233
Derivative time	0 to 3999	Second	40

Note Set “none” as the unit for Controllers with Analog Inputs.

■ **Related parameters**



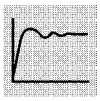
See

“AT execute/cancel” (adjustment level)

C-SC Cooling coefficient

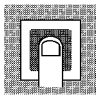
The control must be either heating/cooling control and 2-PID control.

If the heating/cooling characteristics of the control target greatly differ, preventing satisfactory control characteristics from being obtained by the same PID parameters, adjust the proportional band (P) at the control output 2 side by adding the cooling coefficient to balance control between the control output 1 and control output 2 sides.


Function

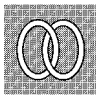
In heating/cooling control, control output 2 side P is calculated by the following formula to set the cooling coefficient:

Control output 2 side P = Cooling coefficient × P (proportional band)


Setting

Setting Range	Unit	Default
0.01 to 99.99	None	1.00

■ **Related parameters**

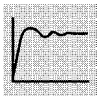

See

“Proportional band” (adjustment level)

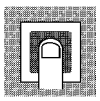
C-db Dead band

The control system must be heating/cooling control.

This parameter sets the output dead band width in a heating/cooling control system. A negative setting sets an overlap band.


Function

- This parameter sets an area in which the control output is “0” centering around the set point in a heating/cooling control system.

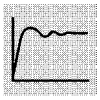

Setting

Setting Range	Unit	Default
–199.9 to 999.9	EU	0.0

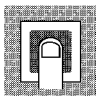
Note Set “none” as the unit for Controllers with Analog Inputs.

oF-r Manual reset value

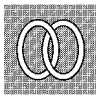
The control must be standard control and 2-PID control. The "integral time" parameter must be set to "0".


Function

- This parameter sets the required manipulated variable to remove offset during stabilization of P or PD control.


Setting

Setting Range	Unit	Default
0.0 to 100.0	%	50.0


See

■ **Related parameters**

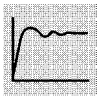
"PID ON/OFF" (initial setting level)
"Integral time" (adjustment level)

HYS Hysteresis (OUT1)

CHYS Hysteresis (OUT2)

The control must be ON/OFF control.

This parameter sets the hysteresis for ensuring stable operation at ON/OFF switching.

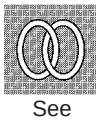

Function

- In a standard control, use the "hysteresis (OUT1)" parameter. The "hysteresis (OUT2)" parameter cannot be used.
- In a heating/cooling control, the hysteresis can be set independently for heating/cooling. Use the "hysteresis (OUT1)" parameter to set the control output 1 side hysteresis, and use the "hysteresis (OUT2)" parameter to set the control output 2 side hysteresis.


Setting

Setting Range	Unit	Default
0.1 to 999.9	EU	1.0

Note Set "none" as the unit for Controllers with Analog Inputs.

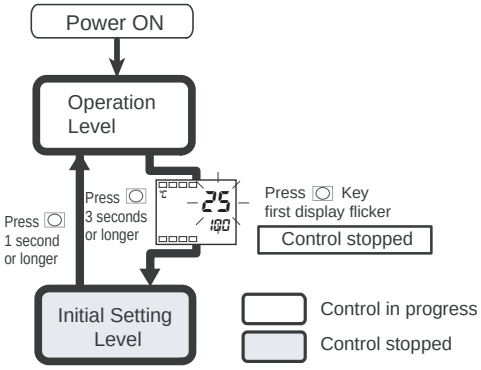

See

■ **Related parameters**

"PID ON/OFF" (initial setting level)

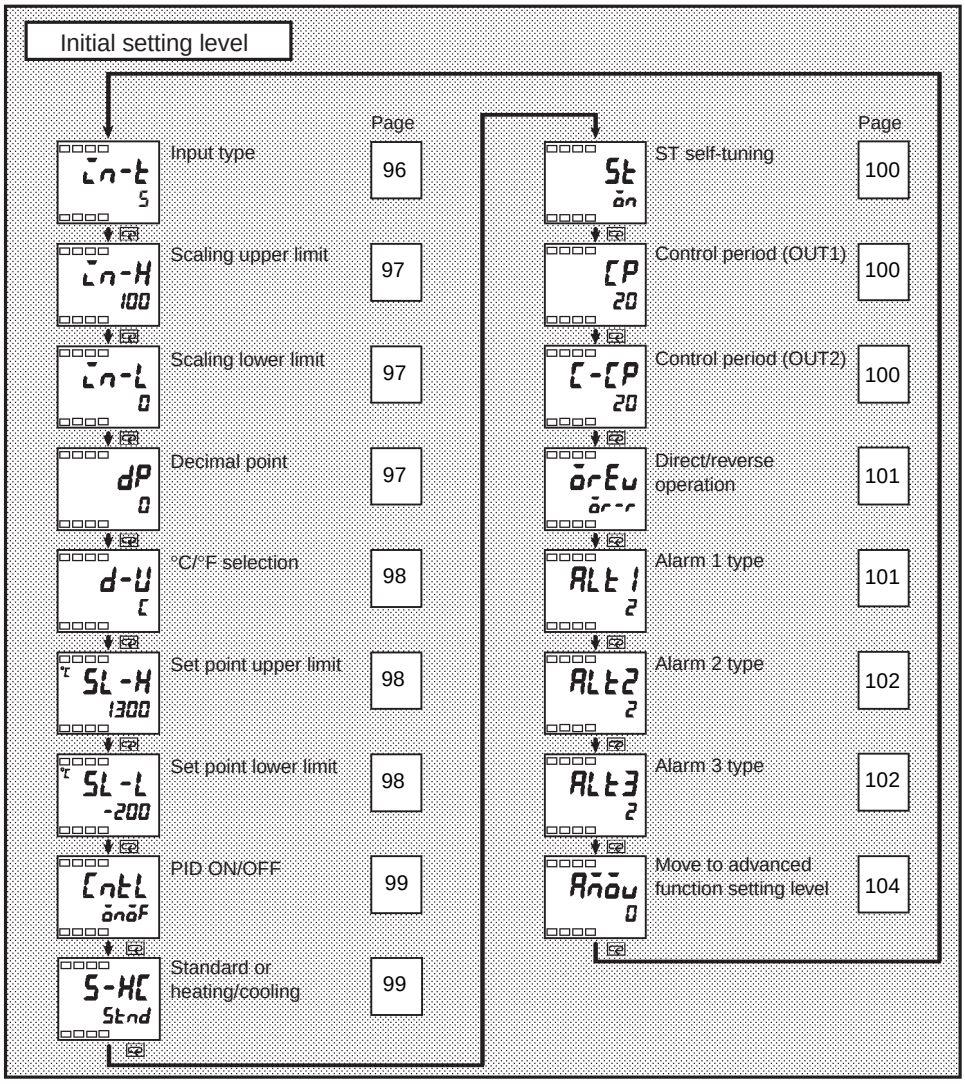
5-5 Initial Setting Level

This level is for setting up the basic specifications of the E5AZ/E5EZ. In this level, you can set the “input type” parameter for selecting the sensor input to be connected to the E5AZ/E5EZ, limit the setting range of set points or set the alarm mode.

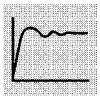


To move from the operation level to the initial setting level, press ◯ key for three seconds or more.

- The initial setting level is not displayed when “initial setting/communications protect” is set to “2”. This initial setting level can be used when “initial setting/communications protect” is set to “0” or “1”.
- The “scaling upper limit”, “scaling lower limit” and “decimal point” parameters are displayed when analog input is selected as the input type.


Initial setting level
Page
Input type
96
Scaling upper limit
97
Scaling lower limit
97
Decimal point
97
°C/°F selection
98
Set point upper limit
98
Set point lower limit
98
PID ON/OFF
99
Standard or heating/cooling
99
Page
ST self-tuning
100
Control period (OUT1)
100
Control period (OUT2)
100
Direct/reverse operation
101
Alarm 1 type
101
Alarm 2 type
102
Alarm 3 type
102
Move to advanced function setting level
104

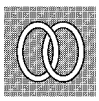
in-t Input type


Function


Setting

- This parameter sets the sensor type by a corresponding code.
- When this parameter is changed, the set point upper limit is changed to the default. If the set point limits must be changed, set the "set point upper limit" and "set point lower limit" parameters (initial setting level).
- Set the code according to the following table. Shaded ranges indicate default settings.

Input type	Name	Set Value	Input Temperature Range
Platinum resistance thermometer	Pt100	0	–200 to 850 (°C)/–300 to 1500 (°F)
		1	–199.9 to 500.0 (°C)/–199.9 to 900.0 (°F)
		2	0.0 to 100.0 (°C)/0.0 to 210.0 (°F)
	JPt100	3	–199.9 to 500.0 (°C)/–199.9 to 900.0 (°F)
		4	0.0 to 100.0 (°C)/0.0 to 210.0 (°F)
Thermocouple	K	5	–200 to 1300 (°C)/–300 to 2300 (°F)
		6	–20.0 to 500.0 (°C)/0.0 to 900.0 (°F)
	J	7	–100 to 850 (°C)/–100 to 1500 (°F)
		8	–20.0 to 400.0 (°C)/0.0 to 750.0 (°F)
	T	9	–200 to 400 (°C)/–300 to 700 (°F)
		22	–199.9 to 400.0 (°C)/–199.9 to 700.0 (°F)
	E	10	0 to 600 (°C)/0 to 1100 (°F)
	L	11	–100 to 850 (°C)/–100 to 1500 (°F)
	U	12	–200 to 400 (°C)/–300 to 700 (°F)
		23	–199.9 to 400.0 (°C)/–199.9 to 700.0 (°F)
	N	13	–200 to 1300 (°C)/–300 to 2300 (°F)
	R	14	0 to 1700 (°C)/0 to 3000 (°F)
	S	15	0 to 1700 (°C)/0 to 3000 (°F)
	B	16	100 to 1800 (°C)/300 to 3200 (°F)
Infrared temperature sensor ES1B	10 to 70°C	17	0 to 90 (°C)/0 to 190 (°F)
	60 to 120°C	18	0 to 120 (°C)/0 to 240 (°F)
	115 to 165°C	19	0 to 165 (°C)/0 to 320 (°F)
	140 to 260°C	20	0 to 260 (°C)/0 to 500 (°F)
Analog input	0 to 50 mV	21	One of following ranges depending on the results of scaling: –1999 to 9999, –199.9 to 999.9


See

■ **Related parameters**

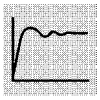
"°C/°F selection" "Set point upper limit" "Set point lower limit" (initial setting level)

Scaling upper limit

Scaling lower limit

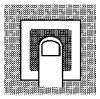
Decimal point

The input type must be set to analog input.



Function

- These parameters can be used when voltage input is selected as the input type.
- When voltage input is selected as the input type, scaling is carried out. Set the upper limit in the “scaling upper limit” parameter and the lower limit in the “scaling lower limit” parameter.
- The “decimal point” parameter specifies the decimal point position of parameters (set point, etc.) whose unit is set to EU.



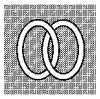
Setting

- Scaling upper limit, Scaling lower limit

Parameter	Setting Range	Unit	Default
Scaling upper limit	Scaling lower limit +1 to 9999	None	100
Scaling lower limit	–1999 to scaling upper limit –1	None	0

- Decimal point: Default is “0: 0 digits past decimal point”

Set value	Setting	Example
0	0 digits past decimal point	1234
1	1 digit past decimal point	123.4



See

■ **Related parameters**

“Input type” (initial setting level)

d-U °C/°F selection

The input type must be set to temperature input.

Function

- Set the temperature input unit to either of "°C" or "°F".

Setting

Setting Range	Default
C: °C/F: °F	C

See

■ **Related parameters**

"Input type" (initial setting level)

SL-H Set point upper limit

SL-L Set point lower limit

Function

- This parameter limits the upper and lower limits when the SP is set. The SP can be set within the range defined by the upper- and lower-limit set values in the "set point upper limit" and "set point lower limit" parameters. The existing SP settings that are out of the range are forcibly changed to one of the upper- or lower-limit values (whichever is closest).
- When the temperature input type and temperature unit have been changed, the set point upper limit and set point lower limit are forcibly changed to the upper and lower limits of the sensor.
- During temperature input, the decimal point position is dependent on the currently selected sensor. During analog input, it is dependent on the "decimal point" parameter setting.

Setting

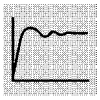
Parameter	Setting Range	Unit	Default
Set point upper limit	Set point lower limit +1 to sensor range upper limit	EU	1300
Set point lower limit	Sensor range lower limit to set point upper limit –1	EU	–200

See

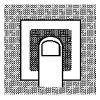
■ **Related parameters**

"Input type" "°C/°F selection" (initial setting level)

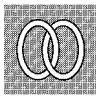
CntL PID ON/OFF


Function

- This parameter selects 2-PID control or ON/OFF control.
- The AT and ST tuning functions can be used in 2-PID control.


Setting

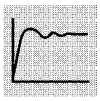
Setting Range	Default
PID: 2-PID /onOF: ON/OFF	onOF


See

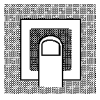
■ **Related parameters**

"AT execute/cancel" "Manual reset" "Hysteresis (OUT1)" "Hysteresis (OUT2)" (adjustment level)
"ST stable range" (advanced function setting level)

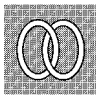
S-HC Standard or heating/cooling


Function

- This parameter selects standard control or heating/cooling control.
- When heating/cooling control is selected, the alarm 3 output terminal "ALM3" is used for control output 2 side output. So, alarm 3 cannot be used.


Setting

Setting Range	Default
Stnd: Standard /H-C: Heating/cooling	Stnd


See

■ **Related parameters**

"MV monitor (OUT1)" "MV monitor (OUT2)" (operation level)
"Alarm value" "Alarm value upper limit 3" "Alarm value lower limit 3" (operation level)
"Hysteresis (OUT2)" "Cooling coefficient" "Dead band" (adjustment level)
"Control period (OUT2)" (initial setting level)
"Alarm 3 type" (initial setting level)
"Alarm 3 hysteresis" "Alarm 3 open in alarm" (advanced function setting level)

ST self-tuning

The control must be set to temperature input, standard control and 2-PID control.

Function

- The ST (self-tuning) function executes tuning from the start of program execution to calculate PID constants matched to the control target. When the ST function is in operation, be sure to turn the power supply of the load connected to the control output ON simultaneously with or before starting operation of the E5AZ/E5EZ.

Setting

Parameter	Setting Range	Unit	Default
ST	OFF: ST function OFF /on: ST function ON	None	on

See

■ **Related parameters**

"ST stable range" (advanced function setting level)
"Input type" "PID ON/OFF" (initial setting level)

Control period (OUT1)

Control period (OUT2)

The control must be set to 2-PID control.

Function

- This parameter sets the output period. Set the control period taking the control characteristics and the electrical life expectancy of the relay into consideration.
- In a standard control system, use the "control period (OUT1)" parameter. The "control period (OUT2)" parameter cannot be used.
- In a heating/cooling control system, the control period can be set independently for heating/cooling. Use the "control period (OUT1)" parameter to set the heating side control period, and use the "control period (OUT2)" parameter to set the cooling side control period.
- Whenever control output 1 is the current output, "control period (OUT1)" cannot be used.

Setting

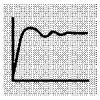
Parameter	Setting Range	Unit	Default
Control period (OUT1)	1 to 99	Second	20
Control period (OUT2)	1 to 99	Second	20

See

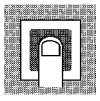
■ **Related parameters**

"PID ON/OFF" (initial setting level)

ōrEu Direct/reverse operation


Function

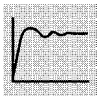
• “Direct operation” refers to control where the manipulated variable is increased according to the increase in the process value. Alternatively, “reverse operation” refers to control where the manipulated variable is increased according to the decrease in the process value.


Setting

Setting Range	Default
ōr-r: Reverse operation /ōr-d: Direct operation	ōr-r

ALt 1 Alarm 1 type

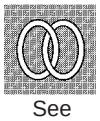
The alarm 1 type must be supported.


Function

• Select one of the following alarm 1 types:
Deviation/Deviation range/Absolute value


Setting

Refer to the alarm type list on the following page.


See

■ **Related parameters**

“Alarm value 1” (operation level)
“Alarm value upper limit 1” “Alarm value lower limit 1” (operation level)
“Standby sequence reset” “Alarm 1 open in alarm” “Alarm 1 hysteresis” “Alarm 1 latch” (advanced function setting level)

ALT2 **Alarm 2 type**

ALT3 **Alarm 3 type**

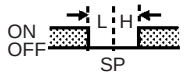
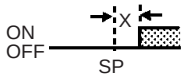
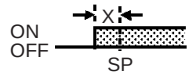
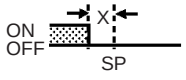
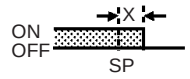
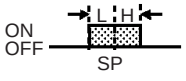
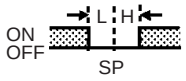
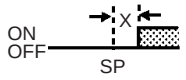
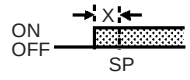
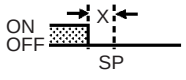
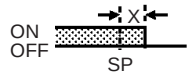
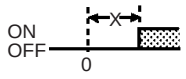
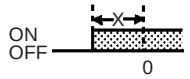
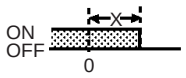
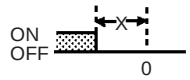
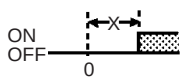
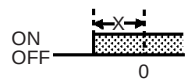
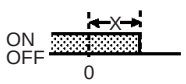
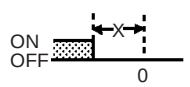
The alarm 2, 3 type must be supported.

The control must be set to standard control.

Function

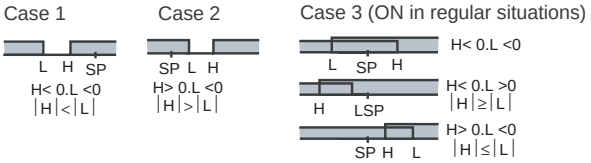
Setting

- Select one of the following alarm 2, 3 types:
  Deviation/Deviation range/Absolute value

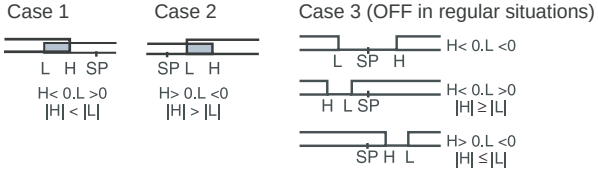
Set Value	Alarm Type	Alarm Output Operation	
		When alarm value X is positive	When alarm value X is negative
0	Alarm function OFF	Output OFF	
1	Upper- and lower-limit (deviation) (See note 1.)		(See note 2.)
2	Upper-limit (deviation)		
3	Lower-limit (deviation)		
4	Upper- and lower-limit range (deviation) (See note 1.)		(See note 3.)
5	Upper- and lower-limit alarm with standby sequence (deviation) (See note 1.)	 (See note 5.)	(See note 4.)
6	Upper-limit alarm with standby sequence (deviation)		
7	Lower-limit alarm with standby sequence (deviation)		
8	Absolute-value upper-limit		
9	Absolute-value lower-limit		
10	Absolute-value upper-limit with standby sequence		
11	Absolute-value lower-limit with standby sequence		

Note (1) With set values 1, 4 and 5, the upper- and lower-limit values can be set independently for each alarm point, and are expressed as “L” and “H”.

(2) Set value 1: Upper- and lower-limit alarms



(3) Set value 4: Upper- and lower-limit range alarm



(4) Set value 5: Upper- and lower-limit alarms with standby sequence

- The upper- and lower-limit alarms described above.
- In cases 1 and 2, if there is significant overlap between the upper- and lower-limit values after hysteresis, the alarm will always be OFF. Examples of case 1 and 2 : In case 3, under general conditions, the alarm is turned OFF.

(5) Set value 5: Upper- and lower-limit alarms with standby sequence

If there is significant overlap between the upper- and lower-limit values after hysteresis, the alarm will always be OFF.

Note

- Alarm types are set independently for each alarm in the “alarm 1 type”, “alarm 2 type” and “alarm 3 type” parameters (initial setting level). Defaults is “2: Upper- limit alarm”.

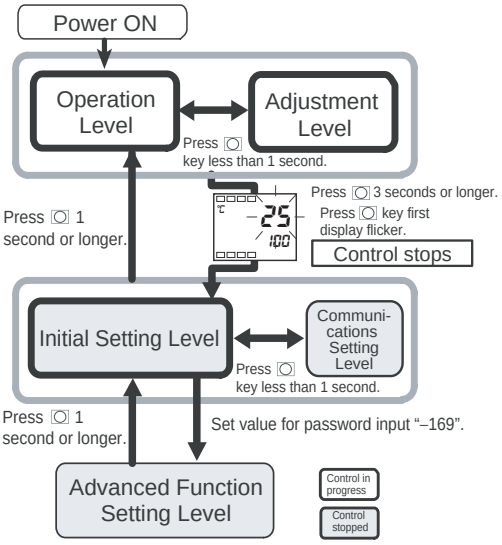
■ **Related parameters**


See

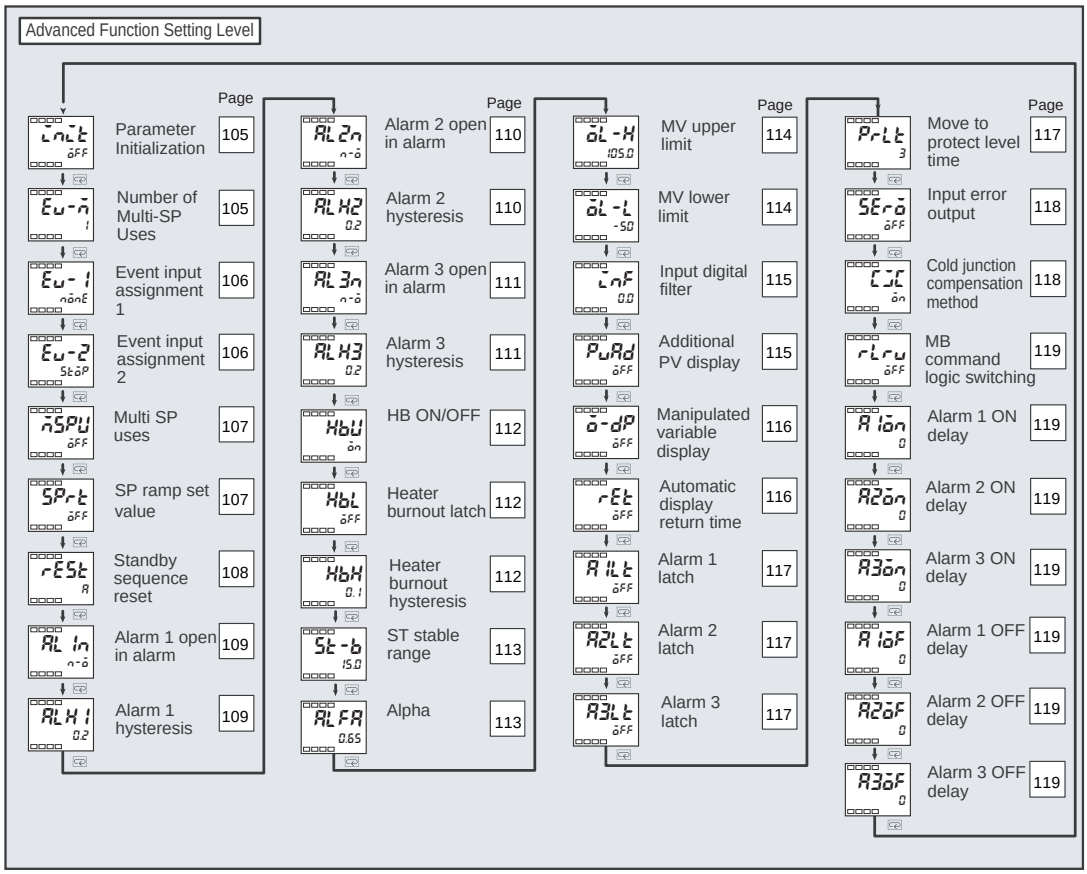
“Alarm value 2, 3” (operation level)
“Alarm value upper limit 2, 3” “Alarm value lower limit 2, 3” (operation level)
“Standby sequence reset” “Alarm 2, 3 open in alarm” “Alarm 2, 3 hysteresis” “Alarm 2, 3 latch” (advanced function setting level)

5-6 Advanced Function Setting Level

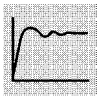
This permits the maximum use of the E5AZ/E5EZ's functions. In the "Initial Setting Level" enter the password ("–169") to switch to this level. When entering password, "initial setting/communications protect" setting value must be set to "0".



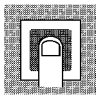
- When the set value for "Initial setting/communications protect" is "0", the parameter in the level can be used.
- Press the ◯ key to switch between different set levels.
- Press the ⌃ or ⌄ key to change the set value.



Parameter Initialization


Function

This parameter returns parameter settings to their defaults.

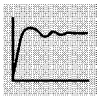

Setting

ON: Initializes all parameters.

OFF: Turns the E5AZ/E5EZ OFF after returning parameter settings to their defaults.

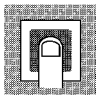
Number of Multi-SP Uses

The option event input unit E53-AZB must be mounted in the E5AZ/E5EZ.


Function

"Multi-SP" is a function for setting set points 0 to 3 in advance, and selecting these set points by a combination of event inputs 1 and 2.

The "number of multi-SP uses" parameter is used when the number of preset set points is 2 or 4. This parameter determines display or non-display of the "event input assignment 1" and "event input assignment 2" parameters.


Setting

The "number of multi-SP uses" displays which functions are assigned to event inputs 1 and 2.

Number of Multi-SP Uses	Setting		Event Input Function	
	Event input assignment 1	Event input assignment 2	Event input 1 function	Event input 2 function
0	NONE or STOP (See note.)		NONE or RUN/STOP switching (See note.)	
1	– (not displayed)	NONE or STOP	Multi–SP 2 set points (set point 0/1 switching)	NONE or RUN/STOP switching
2	– (not displayed)		Multi–SP 4 set points (set point 0/1/2/3 switching)	

Note "STOP (RUN/STOP) switching" can be set only on one of event input assignments 1 or 2. The event input on the side that is set can be used. The setting on the other side becomes "NONE".

- Default: 1

  Multi-SP can be used when the option event input unit E53-AZB is mounted on the E5AZ/E5EZ, and the "number of multi-SP uses" is set to "1" or "2".

- When the number of multi-SP uses is set to "1"

Event input 1	Selected Set Point
OFF	Set point 0
ON	Set point 1

- When the number of multi-SP uses is set to “2”

Event input 1	Event input 2	Selected Set Point
OFF	OFF	Set point 0
ON	OFF	Set point 1
OFF	ON	Set point 2
ON	ON	Set point 3

Note Event input can be used when the option event input unit E53-AZB is mounted in the E5AZ/E5EZ. Select event input ON/OFF while the E5AZ/E5EZ is turned ON. Judgment of event input ON/OFF is carried out on event inputs of 50 ms or more.


See

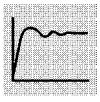
■ **Related parameters**

“Event input assignment 1” (advanced function setting level)
“Event input assignment 2” (advanced function setting level)
“Multi-SP uses” (advanced function setting level)
“Set point 0” “Set point 1” “Set point 2” “Set point 3” (adjustment level)

Event input assignment 1

Event input assignment 2

The number of multi-SP uses must be set to “0” or “1”.

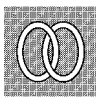

Function

- The following functions are assigned as event input 1 or event input 2:
  “Run/stop”


Setting

Settings	Function
none	None
STOP	RUN/STOP

- Default is “none” for event input assignment 1 and “STOP” for event input assignment 2.

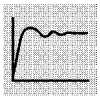

See

■ **Related parameters**

“Set point 0” “Set point 1” “Set point 2” “Set point 3” (adjustment level)
“Number of multi-SP uses” (advanced function setting level)

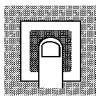
nSPU Multi-SP uses

The "number of multi-SP uses" parameter must be set to "0" on models on which the option event input unit E53-AZB is not mounted.


Function

When the "multi-SP uses" parameter is set to "ON", you can select set points 0 to 3 by operating the keys on the front panel of the controller.

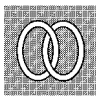
When the option event input unit E53-AZB is mounted on the E5AZ/E5EZ, this parameter can be used when the "number of multi-SP uses" parameter is set to "0" and "multi-SP uses" is set to ON.


Setting

oN: You can select set points 0 to 3.

oFF: You cannot select set points 0 to 3.

• Default: OFF

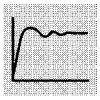

See

■ **Related parameters**

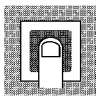
"Multi-SP" (operation level)
"Number of Multi-SP uses" (advanced function setting level)

SPrt SP ramp set value

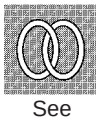
ST (self-tuning) must be set to "OFF".


Function

- This parameter specifies the change rate during SP ramp operation. Set the maximum permissible change width per unit of time (minute) as the "SP ramp set value". However, note that when the "SP ramp set value" is set to "OFF", the SP ramp function is disabled.
- During temperature input, the decimal point position of the SP ramp set value is dependent on the currently selected sensor, and during analog input it is dependent on scaling.


Setting

Parameter	Setting Range	Unit	Default
SP ramp set value	OFF, 1 to 9999	EU	oFF


See

■ **Related parameters**

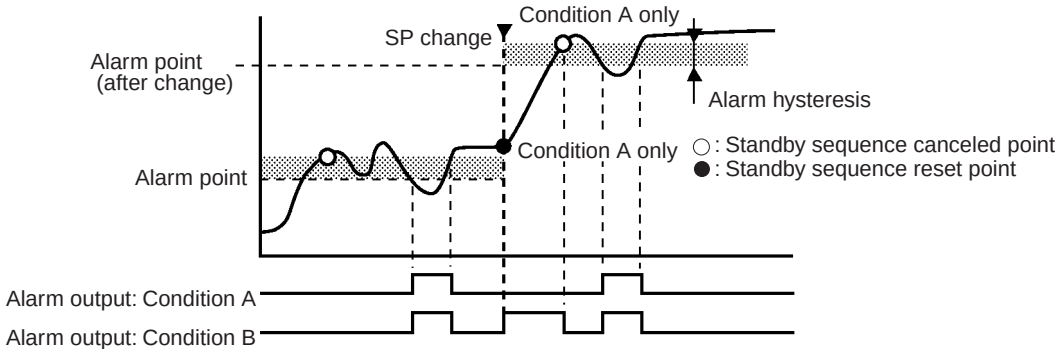
"Input type" "Scaling upper limit" "Scaling lower limit" "Decimal point" "ST" (initial setting level)

rESt Standby sequence reset

The alarm 1 to 3 type must be set to "with standby sequence."

Function

- This parameter selects the conditions for enabling reset after the standby sequence of the alarm has been canceled.
- Output is turned OFF when the initial setting level, communications setting level, or advanced function setting level is switched to.
- Condition A:
  Control started (including power ON), and set point, alarm value (alarm value upper- and lower-limit) or input shift value (upper- and lower-limit temperature input shift value) changed
- Condition B:
  Power ON
- The following example shows the reset action when the alarm type is lower-limit alarm with standby sequence.



Setting

Setting Range	Default
A: Condition A / b: Condition B	A

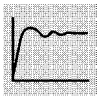
See

■ **Related parameters**

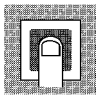
"Alarm 1 type" "Alarm 2 type" "Alarm 3 type" (initial setting level)
"Alarm 1 to 3 latch" (advanced function setting level)

AL 1n Alarm 1 open in alarm

Alarm 1 function must be supported.

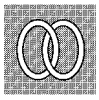

Function

- This parameter sets the output states of alarm 1.
- When the E5AZ/E5EZ is set to “close in alarm,” the status of the alarm output function is normally open. When set to “open in alarm,” the status of the alarm output is output inverted normally, or closed. The following table shows the relationship between alarm output functions, alarm output and output LCDs.
- When “alarm 1 open in alarm” is set to “open in alarm”, the heater burnout alarm and input error output also become “open in alarm.”


Setting

	Alarm Output Function	Alarm Output	Output LCDs
Close in alarm	ON	ON	Lit
	OFF	OFF	Out
Open in alarm	ON	OFF	Lit
	OFF	ON	Out

Setting Range	Default
n-o: Close in alarm / n-C: Open in alarm	n-o

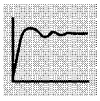

See

■ **Related parameters**

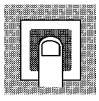
“Alarm value 1” “Alarm value upper limit 1” “Alarm value lower limit 1” (operation level)
“Alarm 1 type” “Standard or heating/cooling” (initial setting level)
“Alarm 1 hysteresis” “Standby sequence reset”, “Alarm 1 latch” (advanced function setting level)

ALH1 Alarm 1 hysteresis

Alarm 1 function must be supported.

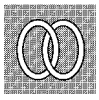

Function

- This parameter sets the hysteresis of alarm output 1.


Setting

Setting Range	Unit	Default
0.1 to 999.9	EU	0.2

Note Set “none” as the unit for Controllers with Analog Inputs.

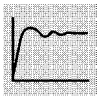

See

■ **Related parameters**

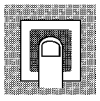
“Alarm value 1” “Alarm value upper limit 1” “Alarm value lower limit 1” (operation level)
“Alarm 1 type” “Standard or heating/cooling” (initial setting level)
“Alarm 1 open in alarm” “Standby sequence reset”, “Alarm 1 latch” (advanced function setting level)

AL2n Alarm 2 open in alarm

Alarm 2 function must be supported.

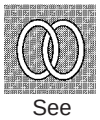

Function

- This parameter sets the output states of alarm 2.
- When the E5AZ/E5EZ is set to “close in alarm,” the status of the alarm output function is normally open. When set to “open in alarm,” the status of the alarm output function is output inverted normally closed. The following table shows the relationship between alarm output functions, alarm output and output LCDs.


Setting

	Alarm Output Function	Alarm Output	Output LCDs
Close in alarm	ON	ON	Lit
	OFF	OFF	Out
Open in alarm	ON	OFF	Lit
	OFF	ON	Out

Setting Range	Default
n-o: Close in alarm/ n-C: Open in alarm	n-o

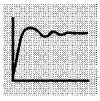

See

■ **Related parameters**

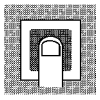
“Alarm value 2” “Alarm value upper limit 2” “Alarm value lower limit 2” (operation level)
“Alarm 2 type” (initial setting level)
“Alarm 2 hysteresis” “Standby sequence reset”, “Alarm 2 latch” (advanced function setting level)

ALH2 Alarm 2 hysteresis

Alarm 2 function must be supported.

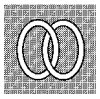

Function

- This parameter sets the hysteresis of alarm output 2.


Setting

Setting Range	Unit	Default
0.1 to 999.9	EU	0.2

Note Set “none” as the unit for Controllers with Analog Inputs.

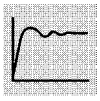

See

■ **Related parameters**

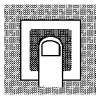
“Alarm value 2” (operation level)
“Alarm value upper limit 2” “Alarm value lower limit 2” (operation level)
“Alarm 2 type” (initial setting level)
“Alarm 2 open in alarm” “Standby sequence reset”, “Alarm 2 latch” (advanced function setting level)

AL3n Alarm 3 open in alarm

Alarm 3 function must be supported.
Control must be set to standard control.

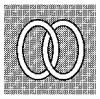

Function

- This parameter sets the output states of alarm 3.
- When the E5AZ/E5EZ is set to “close in alarm,” the status of the alarm output function is normally open. When set to “open in alarm,” the status of the alarm output is output inverted normally, or closed. The following table shows the relationship between alarm output functions, alarm output and output LCDs.


Setting

	Alarm Output Function	Alarm Output	Output LCDs
Close in alarm	ON	ON	Lit
	OFF	OFF	Out
Open in alarm	ON	OFF	Lit
	OFF	ON	Out

Setting Range	Default
n-o: Close in alarm/ n-C: Open in alarm	n-o

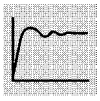

See

■ **Related parameters**

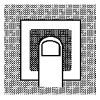
“Alarm value 3” “Alarm value upper limit 3” “Alarm value lower limit 3” (operation level)
“Alarm 3 type” “Standard or heating/cooling” (initial setting level)
“Alarm 3 hysteresis” “Standby sequence reset”, “Alarm 3 latch” (advanced function setting level)

AL H3 Alarm 3 hysteresis

Alarm 3 function must be supported.
Control must be set to standard control.

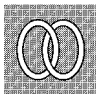

Function

- This parameter sets the hysteresis of alarm output 3.


Setting

Setting Range	Unit	Default
0.1 to 999.9	°C or °F	0.2

Note Set “none” as the unit for Controllers with Analog Inputs.

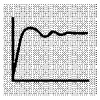

See

■ **Related parameters**

“Alarm value 3” (operation level)
“Alarm value upper limit 3” “Alarm value lower limit 3” (operation level)
“Alarm 3 type” (initial setting level)
“Alarm 3 open in alarm” “Standby sequence reset”, “Alarm 3 latch” (advanced function setting level)

HbU HB ON/OFF

The option event input unit E53-AZH must be mounted in the E5AZ/E5EZ.


Function

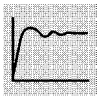
- This parameter sets use of the heater burnout alarm.
- This parameter can be used if available units E53-AZH is installed in E5AZ/E5EZ.


Setting

Setting Range	Default
on: Enabled / oFF: Disabled	on

HbL Heater burnout latch

The "HB ON/OFF" parameter must be set to "ON".


Function

- When this parameter is set to ON, the heater burnout alarm is held until either of the following conditions is satisfied: Output is turned OFF when the initial setting level, communications setting level, or advanced function setting level is switched to.
  - a Heater burnout detection is set to "0.0 A".
  - b The power is turned OFF then back ON again (power is reset).


Setting

Setting Range	Default
on: Enabled / oFF: Disabled	oFF

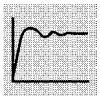

See

■ **Related parameters**

"HB ON/OFF" (advanced function setting level)

HbH Heater burnout hysteresis

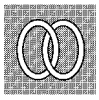
The "heater burnout latch" parameter must be set to OFF.


Function

- This parameter sets the hysteresis when HBA is detected.


Setting

Setting Range	Unit	Default
0.1 to 50.0	A	0.1

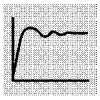

See

■ **Related parameters**

"HB ON/OFF" (advanced function setting level)

ST stable range

The control must be set to temperature input, standard control, PID control, and ST set to “ON”.


Function

- This parameter sets the set value for determining the conditions under which ST (self-tuning) occurs. This parameter cannot be used when the “ST” parameter is set to “OFF”.


Setting

Setting Range	Unit	Default
0.1 to 999.9	EU	15.0

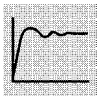

See

■ **Related parameters**

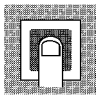
“PID ON/OFF” (initial setting level)
“Input type” (initial setting level)
“ST” (initial setting level)

Alpha

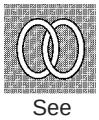
The control must be 2-PID control, and the “ST” parameter must be set to “OFF”.


Function

- Normally, use this parameter at its default.
- This parameter sets 2-PID-constant Alpha.


Setting

Setting Range	Unit	Default
0.00 to 1.00	None	0.65


See

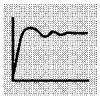
■ **Related parameters**

“PID ON/OFF” (initial setting level)
“ST” (initial setting level)

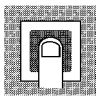
oL-H MV upper limit

oL-L MV lower limit

The control must be 2-PID control, and the "ST" parameter must be set to "OFF".


Function

- The "MV upper limit" and "MV lower limit" parameters set the upper and lower limits of the manipulated variable. When the manipulated variable calculated by the E5AZ/E5EZ exceeds the upper- or lower-limit value, the upper or lower limit set value becomes the output level.

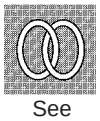

Setting

- MV upper limit
  The setting ranges during standard control and heating/control output 2 control are different.
  The manipulated variable at the cooling side during heating/cooling control is expressed as a negative value.

Control Method	Setting Range	Unit	Default
Standard	MV lower limit +0.1 to 105.0	%	105.0
Heating/cooling	0.0 to 105.0	%	105.0

- MV lower limit
  The setting ranges during standard control and heating/cooling control are different.
  The manipulated variable at the control output 2 side during heating/cooling control is expressed as a negative value.

Control Method	Setting Range	Unit	Default
Standard	–5.0 to MV upper limit –0.1	%	–5.0
Heating/cooling	–105.0 to 0.0	%	–105.0


See

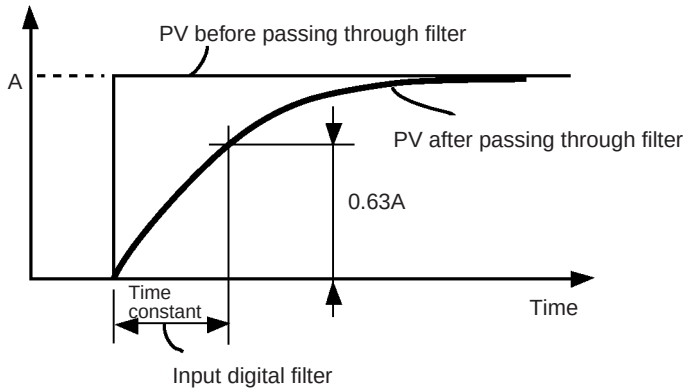
■ **Related parameters**

"PID ON/OFF" (initial setting level)
"ST" (initial setting level)

inF Input digital filter

Function

- Sets the time constant of the input digital filter. The following figure shows the effect on data after passing through the digital filter:



Setting

Setting Range	Unit	Default
0.0 to 999.9	Second	0.0

PVAd Additional PV display

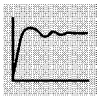
Function

- This parameter adds the facility of displaying only the PV. It is added to the top of the operation level. It is used to give the option of displaying the PV and SP or just the PV only.

Setting

Setting Range	Default
on: Displayed / oFF: Not displayed	oFF

o-dP Manipulated variable display


Function

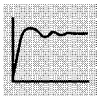
This parameter displays the manipulated variable.

The manipulated variable is displayed when the “manipulated variable monitor (OUT1) and (OUT2)” parameters are set to “ON”, and not displayed when these parameters are set to “OFF”.

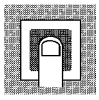

Setting

Setting Range	Default
on: Displayed / oFF: Not displayed	oFF

rEt Automatic display return time


Function

- If you do not operate any of the keys on the front panel for the time set by this parameter in the “operation level” and “adjustment level”, the display automatically returns to the PV/SP display.
- This function is disabled (display does not change automatically) when this parameter is set to “OFF”.


Setting

Setting Range	Unit	Default
OFF, 1 to 99	Second	oFF

A1LT Alarm 1 latch

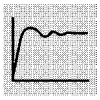
The alarm 1 function must be ON.

A2LT Alarm 2 latch

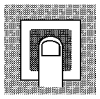
The alarm 2 function must be ON.

A3LT Alarm 3 latch

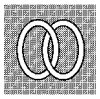
The alarm 3 function must be ON, and control must be standard control.


Function

- When this setting is set to “ON”, the alarm function is held until the power is turned OFF once the alarm function has turned ON. Note, however, that the latch is canceled when the initial setting level, or advanced function setting level is switched to.
- When alarm output function is set to open in alarm, closed output is held, and set to closed in alarm, open output is held.


Setting

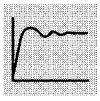
Setting Range	Default
on: ON / oFF: OFF	oFF


See

■ **Related parameters**

“Alarm value 1 to 3” (operation level) (page 81)
“Alarm value upper limit 1 to 3” “Alarm value lower limit 1 to 3” (operation level) (page 82)
“Alarm 1 to 3 type” (initial setting level) (page 101 and page 102)
“Standby sequence reset” (advanced function setting level) (page 108)
“Alarm 1 to 3 open in alarm” “Alarm 1 to 3 hysteresis” (advanced function setting level” (page 109 to page 110)

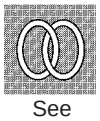
PrLt Move to protect level time


Function

- Sets the key pressing time required for moving to the protect level from the operation level or the adjustment level.


Setting

Setting Range	Unit	Default
1 to 30	Second	3

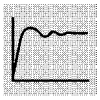

See

■ **Related parameters**

“Operation/adjustment protect” “Initial setting/communications protect” “Setting change protect” (protect level) (page 75)

SEr0 Input error output

The alarm 1 type must be supported.


Function

- When this setting is set to “ON”, alarm 1 output becomes ON at an input error. Note, however, that the alarm 1 operation display does not light.
- The alarm 1 output is the OR output of alarm 1, HB ON/OFF and input error.
- Output is turned OFF by moving to the initial setting level, communications setting level, or advanced function setting level.


Setting

Setting Range	Default
on: ON / oFF: OFF	oFF

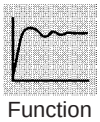

See

■ **Related parameters**

“Input error” (error display) (page 125)

CJC Cold junction compensation method

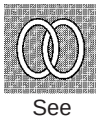
Input type must be thermocouple or infrared temperature sensor


Function

- Specifies whether cold junction compensation is to be performed internally by the controller or to be performed externally when the input type setting value is No.5 to 20, 22 or 23.
- The cold junction compensation external setting is valid when the temperature difference is measured using two thermocouples or two ES1Bs.


Setting

Setting Range	Default
on: internally / oFF: externally	on


See

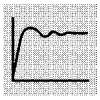
■ **Related parameters**

“Input type” (initial setting level) (page 96)

rLrw

MB command logic switching

Communications function must be supported.


Function

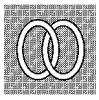
- Switches the logic of MB command (communications writing switching) in the SYSWAY communications procedures.
- The MB command (communications writing switching) is equivalent to the MB command (remote/local switching) on the E5□J.


Setting

- The hatched setting is the default (same logic as E5□J).

Setting Value	Text Data of MB Command	
	0000	0001
OFF	Communications writing enabled (remote mode selection)	Communications writing disabled (local mode selection)
ON	Communications writing disabled (local mode selection)	Communications writing enabled (remote mode selection)

(Terms in parentheses () are the terms used on the E5□J.)


See

■ **Related parameters**

"Communications writing" (adjustment level) (page 87)

A1on

Alarm 1 ON delay

A2on

Alarm 2 ON delay

A3on

Alarm 3 ON delay

A1oF

Alarm 1 OFF delay

A2oF

Alarm 2 OFF delay

A3oF

Alarm 3 OFF delay

Alarm1, 2, 3 type is not "0: Without alarm function"

- This parameter is used to set the output delay for Alarm 1, 2, and 3.
- Output's delayed activation and shutdown can be respectively set.

Setting Range	Units	Initial Value
0 to 99	Seconds	0

Alarm type must be set as any type other than 0.

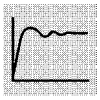
- Related parameters

"Alarm 1, 2, and 3 type" (initial setting level) (page 101 and 102)

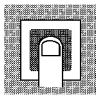
5-7 Communications Setting Level

U-nō	**Communications unit No.**
bPS	**Baud rate**
LEn	**Data length**
SbīT	**Stop bits**
PrtY	**Parity**

Communications function must be supported.

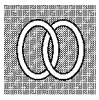

Function

- Each parameter is enabled when the power is reset.
- Match the communications specifications of the E5AZ/E5EZ and the host computer. If a 1 : N connection is being used, ensure that the communications specifications for all devices in the system (except “Communications unit No.”) are the same.


Setting

Parameter	Displayed Characters	Set Value	Setting Range
Communications unit No.	U-nō	0, **1** to 99	0 to 99
Baud rate	bPS	1.2 / 2.4 / 4.8 / **9.6** / 19.2 (kbps)	1.2/2.4/ 4.8/ 9.6/19.2 (kbps)
Data length	LEn	**7 / 8 (bit)**	7/8 (bit)
Stop bits	SbīT	1 / **2**	1/2
Parity	PrtY	nōnE / **EuEn** / ōdd	None/even/odd

Highlighted characters indicate defaults.


See

■ **Related parameters**

“Communications writing” (adjustment level) (page 87)

Appendix

Specifications

Ratings

Supply voltage		100 to 240 VAC, 50/60 Hz	
Operating voltage range		85% to 110% of rated supply voltage	
Power consumption	E5AZ/E5EZ	10 VA	
Sensor input (See note.)		Thermocouple:	K, J, T, E, L, U, N, R, S, B
		Platinum resistance thermometer:	Pt100, JPt100
		Infrared temperature sensor:	10 to 70°C, 60 to 120°C, 115 to 165°C, 140 to 260°C
		Voltage input:	0 to 50 mV
Control output	Relay output	SPST-NO, 250 VAC, 5 A (resistive load), electrical life: 100,000 operations Min. applicable load 5 V 10 mA	
	Voltage output	Output voltage 12 VDC +15%/–20% (PNP), max. load current: 40 mA, with short-circuit protection circuit	
	Current output	4 to 20 mA DC, load: 600 Ω max., resolution: approx. 2,600	
Alarm output		SPST-NO, 250 VAC, 2 A (resistive load), electrical life: 100,000 operations Min. applicable load 5 V 10 mA	
Control method		2-PID or ON/OFF control	
Setting method		Digital setting using front panel keys	
Indication method		7-segment digital display and single-lighting indicator	
Other functions		According to controller model	
Ambient operating temperature		–10 to 55°C (with no condensation or icing)	
Ambient operating humidity		Relative humidity 25 to 85%	
Storage temperature		–25 to 65°C (with no condensation or icing)	
Altitude		2,000 m or less	
Recommended fuse		T2A, 250 VAC, time lag, low shut-off capacity	
Installation environment		Installation Category II, Pollution Class 2 (IEC 61010-1 compliant)	

Note For the setting ranges for each sensor input, see page 133.

HBA (when option unit (E53-AZH) is mounted)

Max. heater current	Single-phase 50 A AC
Input current readout accuracy	±5%FS±1 digit max.
Heater burnout alarm setting range	0.1 to 49.9 A (0.1 A units) 0.0 A: Heater burnout alarm output turns OFF. 50.0 A: Heater burnout alarm output turns ON.
Min. detection ON time	190 ms (See note.)

Note When the control output ON time is less than 190 ms, heater burnout detection and heater current measurement are not carried out.

Characteristics

Indication accuracy	Thermocouple: (±0.5% of indication value or ±1°C, whichever is greater) ±1 digit max. (See note.) Platinum resistance thermometer: (±0.5% of indication value or ±1°C, whichever is greater) ±1 digit max. Analog input: ±0.5%FS±1 digit max. CT input: ±5%FS±1 digit max.	
Hysteresis	0.1 to 999.9EU (in units of 0.1EU)	
Proportional band (P)	0.1 to 999.9EU (in units of 0.1EU)	
Integral time (I)	0 to 3999 (in units of 1 second)	
Derivative time (D)	0 to 3999 (in units of 1 second)	
Control period	1 to 99 (in units of 1 second)	
Manual reset value	0.0 to 100.0% (in units of 0.1%)	
Alarm setting range	–1999 to 9999 (decimal point position depends on input type)	
Sampling period	500 ms	
Insulation resistance	20 MΩ min. (at 500 VDC)	
Dielectric strength	2000 VAC 50 or 60 Hz 1min	
Vibration resistance	10 to 55 Hz, 20 m/s^2 for 10 min. each in X, Y and Z directions	
Shock resistance	100 m/s^2, 3 times each in X, Y, and Z directions	
Weight	E5AZ Approx. 310 g E5EZ Approx. 260 g	Adapter: approx. 100 g
Memory protection	EEPROM (non-volatile memory) (number of writes: 100,000)	

Note The indication of K thermocouples in the –200 to 1300°C range, T and N thermocouples at a temperature of –100°C or less, and U and L thermocouples at any temperature is ±2°C±1 digit maximum. The indication of B thermocouples at a temperature of 400°C or less is unrestricted.
The indication of R and S thermocouples at a temperature of 200°C or less is ±3°C±1 digit maximum.

Current Transformer (CT)

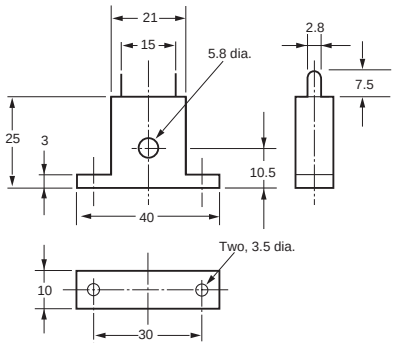
Specifications

Item	Specifications	
Model	E54-CT1	E54-CT3
Max. continuous current	50 A	120 A (See note.)
Dielectric strength	1000 VAC (1 minute)	
Vibration resistance	50 Hz 98m/s^2 {10G}	
Weight	Approx. 11.5 g	Approx. 50 g
Accessory	None	Armature (2) Plug (2)

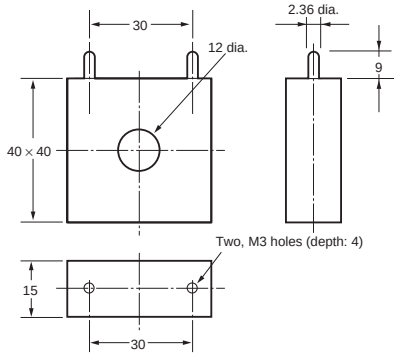
Note The maximum continuous current of the E5AZ/E5EZ is 50 A.

External Dimensions

E54-CT1



E54-CT3



Error Display

When an error has occurred, the No.1 display alternately indicates error codes together with the current display item.

This section describes how to check error codes on the display, and the actions you must take to remedy the problem.

Input error

Meaning

The input value has exceeded the input indication range: –1999 to 9999 or –199.9 to 999.9

Action

Check the wiring of inputs for miswiring, disconnections, short-circuits and the input type.
If no abnormality is found in the wiring and input type, turn the power OFF then back ON again. If the display remains the same, the E5AZ/E5EZ must be repaired. If the display is restored, then a probable cause could be electrical noise affecting the control system. Check for electrical noise.

Operation at error

After the error occurs, the error is displayed, and control output functions turn OFF. (Current output is approx. 0 mA).
Alarm outputs function as if the upper limit value has been exceeded.
When “output input error” (advanced function setting level) is set to ON, the alarm 1 output turns ON when an input error occurs.
An error message is displayed when “process value” or “PV/SP” are displayed.

Display range over

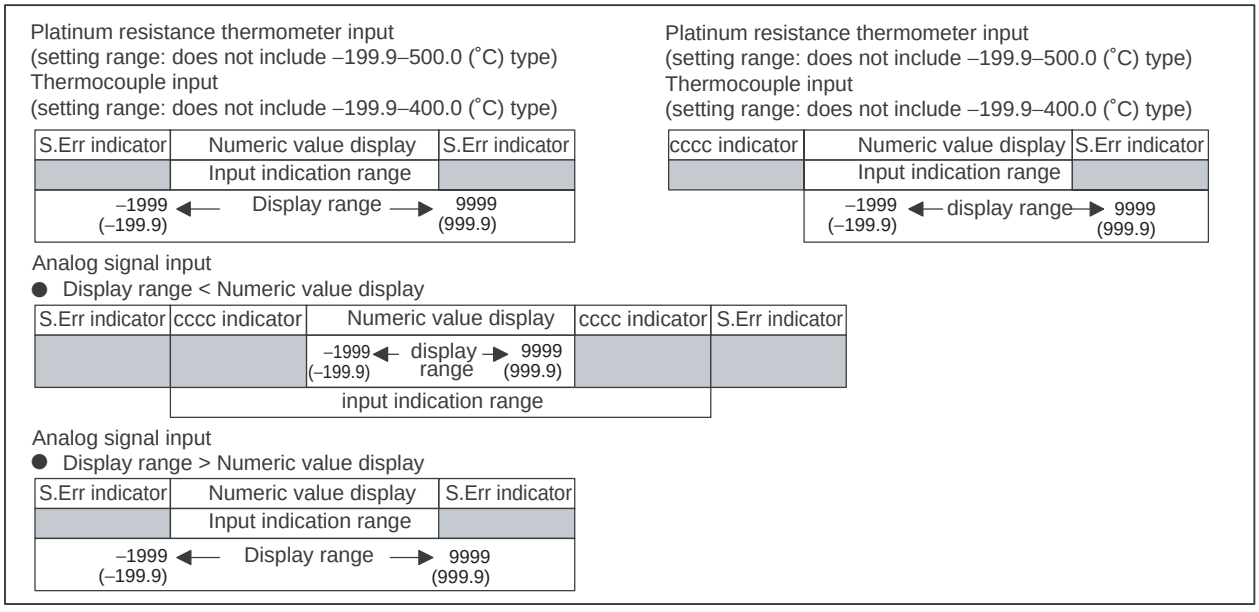
Meaning

Though this is not an error, this is displayed when the process value exceeds the display range when the control range is larger than the display range (–1999 to 9999 or –199.9 to 999.9).

- When less than "–1999 or –199.9" cccc
- When less than "9999 or 999.9" ɔɔɔɔ

Action

Control continues, allowing normal operation. An error message is displayed when "process value" or "PV/SP" are displayed.



Memory error

Meaning

Internal memory operation is in error.

Action

First, turn the power OFF then back ON again. If the display remains the same, the E5AZ/E5EZ must be repaired. If the display is restored, then a probable cause could be electrical noise affecting the control system. Check for electrical noise.

Operation at error

Control output and alarm output turn OFF. (Current output is approx. 0 mA).

H.Err HB error

Meaning

Internal circuits are in error.

Action

First, turn the power OFF then back ON again. If the display remains the same, the E5AZ/E5EZ must be repaired. If the display is restored, then a probable cause can be electrical noise affecting the control system. Check for electrical noise.

Operation at error

Control output and control output functions turn OFF. An error message is displayed when “process value” or “PV/SP” are displayed.

FFFF Current value exceeds

Meaning

This error is displayed when the heater current value exceeds “55.0 A”.

Action

Control continues, allowing normal operation. An error message is displayed when “heater current value monitor” is displayed.

Parameter Operation List

Operation level

Parameters	Characters	Setting (monitor) Value	Display	Default	Unit	Set Value
PV		Sensor input indication range			EU	
PV/SP		SP lower limit to SP upper limit		0	EU	
Multi-SP	ā-SP	0 to 3		0	None	
Set point during SP ramp	SP-ā	SP lower limit to SP upper limit			EU	
Heater current value monitor	CŁ	0.0 to 55.0			A	
Run/stop	r-S	Run/stop	rUn, StōP	Run	None	
Alarm value 1	AL-1	–1999 to 9999		0	EU	
Alarm value upper-limit 1	AL1H	–1999 to 9999		0	EU	
Alarm value lower-limit 1	AL1L	–1999 to 9999		0	EU	
Alarm value 2	AL-2	–1999 to 9999		0	EU	
Alarm value upper-limit 2	AL2H	–1999 to 9999		0	EU	
Alarm value lower-limit 2	AL2L	–1999 to 9999		0	EU	
Alarm value 3	AL-3	–1999 to 9999		0	EU	
Alarm value upper-limit 3	AL3H	–1999 to 9999		0	EU	
Alarm value lower-limit 3	AL3L	–1999 to 9999		0	EU	
MV monitor (OUT1)	ō	0.0 to 100.0 (standard)			%	
		0.0 to 100.0 (heating/cooling)			%	
MV monitor (OUT2)	C-ō	0.0 to 100.0			%	

Adjustment level

Parameters	Characters	Setting (monitor) Value	Display	Default	Unit	Set Value
AT execute/cancel	Ał	OFF, ON	ōFF, ōn	OFF	None	
Communications writing	CōMŁ	OFF, ON	ōFF, ōn	OFF	None	
Heater current value monitor	CŁ	0.0 to 55.0			A	
Heater burnout detection	Hb	0.0 to 50.0		0	A	
Set point 0	SP-0	SP lower limit to SP upper limit		0	EU	
Set point 1	SP-1	SP lower limit to SP upper limit		0	EU	
Set point 2	SP-2	SP lower limit to SP upper limit		0	EU	
Set point 3	SP-3	SP lower limit to SP upper limit		0	EU	
Temperature input shift	InS	–199.9 to 999.9		0.0	°C or °F	
Upper-limit temperature input shift value	InSH	–199.9 to 999.9		0.0	°C or °F	
Lower-limit temperature input shift value	InSL	–199.9 to 999.9		0.0	°C or °F	
Proportional band	P	0.1 to 999.9		8.0	EU	
Integral time	I	0 to 3999		233	Second	
Derivative time	d	0 to 3999		40	Second	
Cooling coefficient	C-SC	0.01 to 99.99		1.00	None	
Dead band	C-db	–199.9 to 999.9		0.0	EU	
Manual reset value	ōF-r	0.0 to 100.0		50.0	%	
Hysteresis (OUT1)	HYS	0.1 to 999.9		1.0	EU	
Hysteresis (OUT2)	CHYS	0.1 to 999.9		1.0	EU	

Initial Setting Level

Parameters	Characters	Setting (monitor) Value		Display	Default	Unit	Set Value
Input type	in-t	Platinum resistance thermometer	0: Pt100 1: Pt100 2: Pt100 3: JPt100 4: JPt100		5	None	
		Thermocouple	5: K 6: K 7: J 8: J 9: T 22: T 10: E 11: L 12: U 23: U 13: N 14: R 15: S 16: B				
		Infrared temperature sensor	17: 10 to 70°C 18: 60 to 120°C 19: 115 to 165°C 20: 140 to 260°C				
		Analog input	21: 0 to 50 mA				
Scaling upper limit	in-H	Scaling lower limit +1 to 9999			100	None	
Scaling lower limit	in-L	–1999 to scaling upper limit –1			0	None	
Decimal point	dP	0,1			0	None	
Temperature unit	d-U	°C, °F		C, F	°C	None	
Set point upper limit	SL-H	SP lower limit +1 to input range lower value (temperature)			1300	EU	
		SP lower limit +1 to scaling upper limit (analog)			1300	EU	
Set point lower limit	SL-L	Input range lower limit to SP upper limit –1 (temperature)			–200	EU	
		Scaling lower limit to SP upper limit –1 (analog)			–200	EU	
PID ON/OFF	CntL	ON/OFF, 2-PID		onoF, PId	ON/OFF	None	
Standard or heating/cooling	5-HC	Standard or heating/cooling		Stnd, H-C	Standard	None	
ST	St	OFF, ON		oFF, on	ON	None	
Control period (OUT1)	CP	1 to 99			20	Second	
Control period (OUT2)	C-CP	1 to 99			20	Second	
Direct/reverse operation	orEu	Direct operation, reverse operation		or-d, or-r	Reverse operation	None	

Parameters	Characters	Setting (monitor) Value	Display	Default	Unit	Set Value
Alarm 1 type	AL1	0: Alarm function OFF 1: Upper- and lower-limit alarm 2: Upper-limit alarm 3: Lower-limit alarm 4: Upper- and lower-limit range alarm 5: Upper- and lower-limit alarm with standby sequence 6: Upper-limit alarm with standby sequence 7: Lower-limit alarm with standby sequence 8: Absolute-value upper-limit alarm 9: Absolute-value lower- limit alarm 10: Absolute-value upper-limit alarm with standby sequence 11: Absolute-value lower-limit alarm with standby sequence		2	None	
Alarm 2 type	AL2	Same as alarm 1 type		2	None	
Alarm 3 type	AL3	Same as alarm 1 type		2	None	
Move to advanced function setting level	Adou	–1999 to 9999		0	None	

Advanced function setting level

Parameters	Characters	Setting (monitor) Value	Display	Default	Unit	Set Value
Parameter initialization	INIT	OFF, ON	oFF, on	OFF	None	
Number of multi-SP uses	Eu-M	0 to 2		1	None	
Event input assignment 1	Eu-1	None, run/stop	nonE, StoP	None	None	
Event input assignment 2	Eu-2	None, run/stop	nonE, StoP	RUN/STOP	None	
Multi-SP uses	MSPU	OFF, ON	oFF, on	OFF	None	
SP ramp monitor	SPrt	OFF, 1 to 9999	oFF, 1 to 9999	OFF	EU	
Standby sequence reset	rESt	Condition A, Condition B	A, b	Condition A	None	
Alarm 1 open in alarm	AL 1n	Open in alarm/Close in alarm	n-o, n-C	Close in alarm	None	
Alarm 1 hysteresis	ALH1	0.1 to 999.9		0.2	EU	
Alarm 2 open in alarm	AL2n	Open in alarm/Close in alarm	n-o, n-C	Close in alarm	None	
Alarm 2 hysteresis	ALH2	0.1 to 999.9		0.2	EU	
Alarm 3 open in alarm	AL3n	Open in alarm/Close in alarm	n-o, n-C	Close in alarm	None	
Alarm 3 hysteresis	ALH3	0.1 to 999.9		0.2	EU	
HB ON/OFF	HbU	OFF, ON	oFF, on	ON	None	
Heater burnout latch	HbL	OFF, ON	oFF, on	OFF	None	
Heater burnout hysteresis	HbH	0.1 to 50.0		0.1	A	
ST stable range	St-b	0.1 to 999.9		15.0	EU	
Alpha	ALFA	0.00 to 1.00		0.65	None	
MV upper limit	oL-H	MV lower limit +0.1 to 105.0 (standard)		105.0	%	
		0.0 to 105.0 (heating/cooling)		105.0	%	
MV lower limit	oL-L	–5.0 to MV upper limit –0.1 (standard)		–5.0	%	
		–105.0 to 0.0 (heating/cooling)		–105.0	%	
Input digital filter	InF	0.0 to 999.9		0.0	Second	
Additional PV display	PuAd	OFF, ON	oFF, on	OFF	None	
MV display	o-dP	OFF, ON	oFF, on	OFF	None	
Automatic display return time	rEt	OFF, 1 to 99	oFF, 1 to 99	OFF	Second	
Alarm 1 latch	A1Lt	OFF, ON	oFF, on	OFF	None	
Alarm 2 latch	A2Lt	OFF, ON	oFF, on	OFF	None	
Alarm 3 latch	A3Lt	OFF, ON	oFF, on	OFF	None	
Move to protect level time	PrLt	1 to 30		3	Second	
Input error output	SErO	OFF, ON	oFF, on	OFF	None	
Cold junction compensation method	CJC	OFF, ON	oFF, on	ON	None	
MB command logic switching	rLru	OFF, ON	oFF, on	OFF	None	
Alarm 1 ON delay	A1on	0 to 99		0	Second	
Alarm 2 ON delay	A2on	0 to 99		0	Second	
Alarm 3 ON delay	A3on	0 to 99		0	Second	
Alarm 1 OFF delay	A1oF	0 to 99		0	Second	
Alarm 2 OFF delay	A2oF	0 to 99		0	Second	
Alarm 3 OFF delay	A3oF	0 to 99		0	Second	

Protect level

Parameters	Characters	Setting (monitor) Value	Display	Default	Unit	Set Value
Operation/adjustment protect	oAPt	0 to 3		0	None	
Initial setting/ communications protect	iCPt	0 to 2		1	None	
Setting change protect	wtPt	OFF, ON	oFF, on	OFF	None	

Communications setting level

Parameters	Characters	Setting (monitor) Value	Display	Default	Unit	Set Value
Communications unit No.	U-no	0 to 99		1	None	
Baud rate	bPS	1.2, 2.4, 4.8, 9.6, 19.2	1.2, 2.4, 4.8, 9.6, 19.2	9.6	kbps	
Data length	LEn	7, 8		7	bit	
Stop bits	Sbit	1, 2		2	bit	
Parity	PrtY	None, Even, Odd	non E, Eu En, odd	Even	None	

Sensor Input Setting Ranges

Input type	Specifications	Set Value	Input Temperature Setting Range	Input indication range
Platinum resistance thermometer	Pt100	0	–200 to 850 (°C)/–300 to 1500 (°F)	–220 to 870 (°C)/–340 to 1540 (°F)
		1	–199.9 to 500.0 (°C)/–199.9 to 900.0 (°F)	–199.9 to 520.0 (°C)/–199.9 to 940.0 (°F)
		2	0.0 to 100.0 (°C)/0.0 to 210.0 (°F)	–20.0 to 120.0 (°C)/–40.0 to 250.0 (°F)
	JPt100	3	–199.9 to 500.0 (°C)/–199.9 to 900.0 (°F)	–199.9 to 520.0 (°C)/–199.9 to 940.0 (°F)
		4	0.0 to 100.0 (°C)/0.0 to 210.0 (°F)	–20.0 to 120.0 (°C)/–40.0 to 250.0 (°F)

Input type	Specifications	Set Value	Input Temperature Setting Range	Input indication range
Thermocouple	K	5	–200 to 1300 (°C)/–300 to 2300 (°F)	–220 to 1320 (°C)/–340 to 2340 (°F)
		6	–20.0 to 500.0 (°C)/0.0 to 900.0 (°F)	–40.0 to 520.0 (°C)/–40.0 to 940.0 (°F)
	J	7	–100 to 850 (°C)/–100 to 1500 (°F)	–120 to 870 (°C)/–140 to 1540 (°F)
		8	–20.0 to 400.0 (°C)/0.0 to 750.0 (°F)	–40.0 to 420.0 (°C)/–40.0 to 790.0 (°F)
	T	9	–200 to 400 (°C)/–300 to 700 (°F)	–220 to 420 (°C)/–340 to 740 (°F)
		22	–199.9 to 400.0 (°C)/–199.9 to 700.0 (°F)	–199.9 to 420.0 (°C)/–199.9 to 740.0 (°F)
	E	10	0 to 600 (°C)/0 to 1100 (°F)	–20 to 620 (°C)/–40 to 1140 (°F)
	L	11	–100 to 850 (°C)/–100 to 1500 (°F)	–120 to 870 (°C)/–140 to 1540 (°F)
	U	12	–200 to 400 (°C)/–300 to 700 (°F)	–220 to 420 (°C)/–340 to 740 (°F)
		23	–199.9 to 400.0 (°C)/–199.9 to 700.0 (°F)	–199.9 to 420.0 (°C)/–199.9 to 740.0 (°F)
	N	13	–200 to 1300 (°C)/ –300 to 2300 (°F)	–220 to 1320 (°C)/ –340 to 2340 (°F)
	R	14	0 to 1700 (°C)/0 to 3000 (°F)	–20 to 1720 (°C)/–40 to 3040 (°F)
	S	15	0 to 1700 (°C)/0 to 3000 (°F)	–20 to 1720 (°C)/–40 to 3040 (°F)
	B	16	100 to 1800 (°C)/300 to 3200 (°F)	0 to 1820 (°C)/0 to 3240 (°F)
Infrared temperature sensor ES1B	10 to 70°C	17	0 to 90 (°C)/0 to 190 (°F)	–20 to 130 (°C)/–40 to 270 (°F)
	60 to 120°C	18	0 to 120 (°C)/0 to 240 (°F)	–20 to 160 (°C)/–40 to 320 (°F)
	115 to 165°C	19	0 to 165 (°C)/0 to 320 (°F)	–20 to 205 (°C)/–40 to 400 (°F)
	140 to 260°C	20	0 to 260 (°C)/0 to 500 (°F)	–20 to 300 (°C)/–40 to 580 (°F)
Analog input	0 to 50 mV	21	One of following ranges depending on the results of scaling: –1999 to 9999, –199.9 to 999.9	–5 to 105% of the setting range (however, display –1999 to 9999 or –199.9 to 999.9)

The applicable standards for each of the above input ranges are as follows:

K, J, T, E, N, R, S, B: JIS C1602-1995, IEC 584-1
L: Fe-CuNi, DIN 43710-1985
U: Cu-CuNi, DIN 43710-1985
JPt100: JIS C 1604-1989, JIS C 1606-1989
Pt100: JIS C 1604-1997 IEC 751
Default is set value “5”.

Control Range

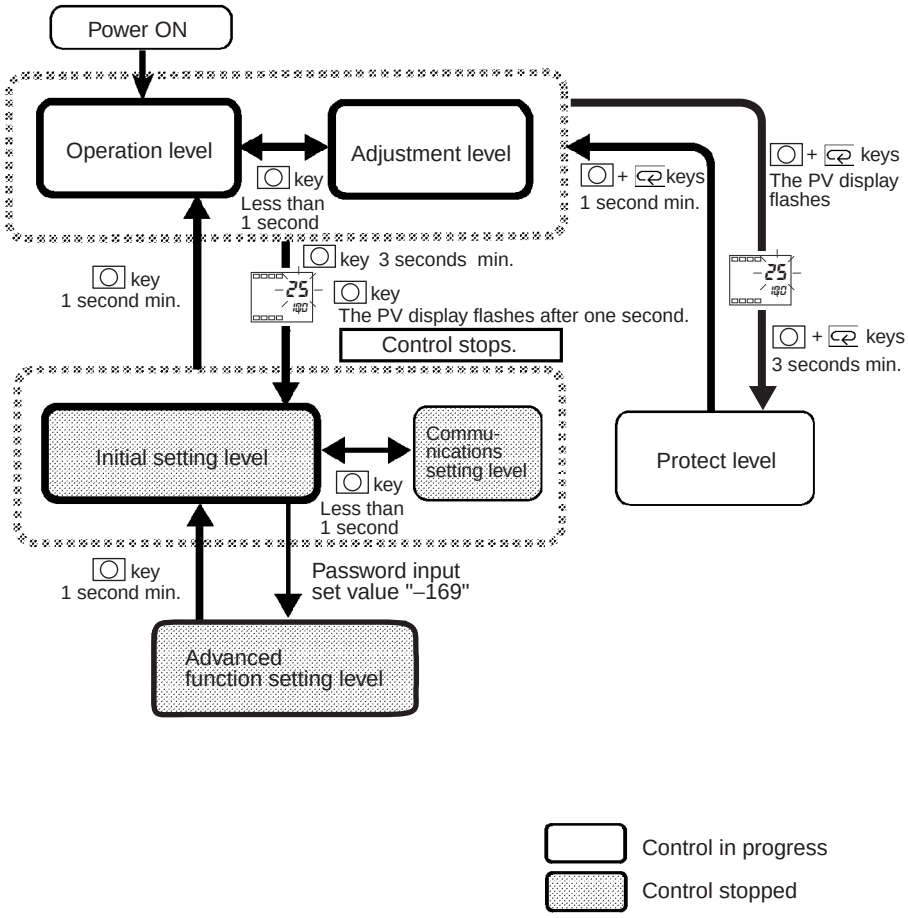
- Platinum resistance thermometer and thermocouple input
  –20°C of temperature setting lower limit to +20°C of the temperature setting upper limit
  Or, –40°F of temperature setting lower limit to +40°F of the temperature setting upper limit
- ES1B input
  Same as input indication range
- Analog input
  –5% to +105% of scaling range

Setting Levels Diagram

The following chart gives an overview of the setting levels on the E5AZ/E5EZ.

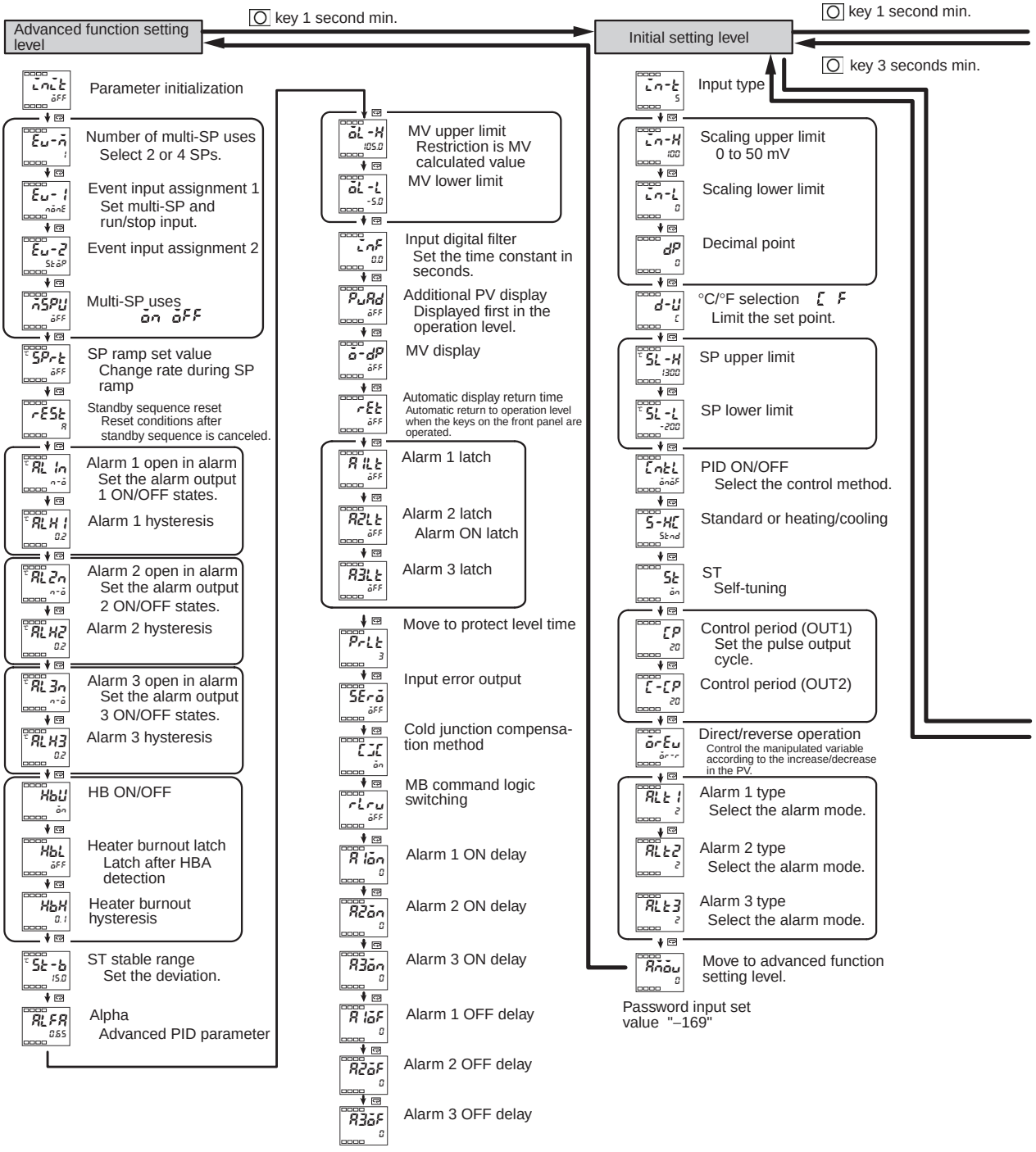
To switch to the advanced function setting level, you must input the password. Certain parameters will not be displayed, based on protect level settings and usage conditions.

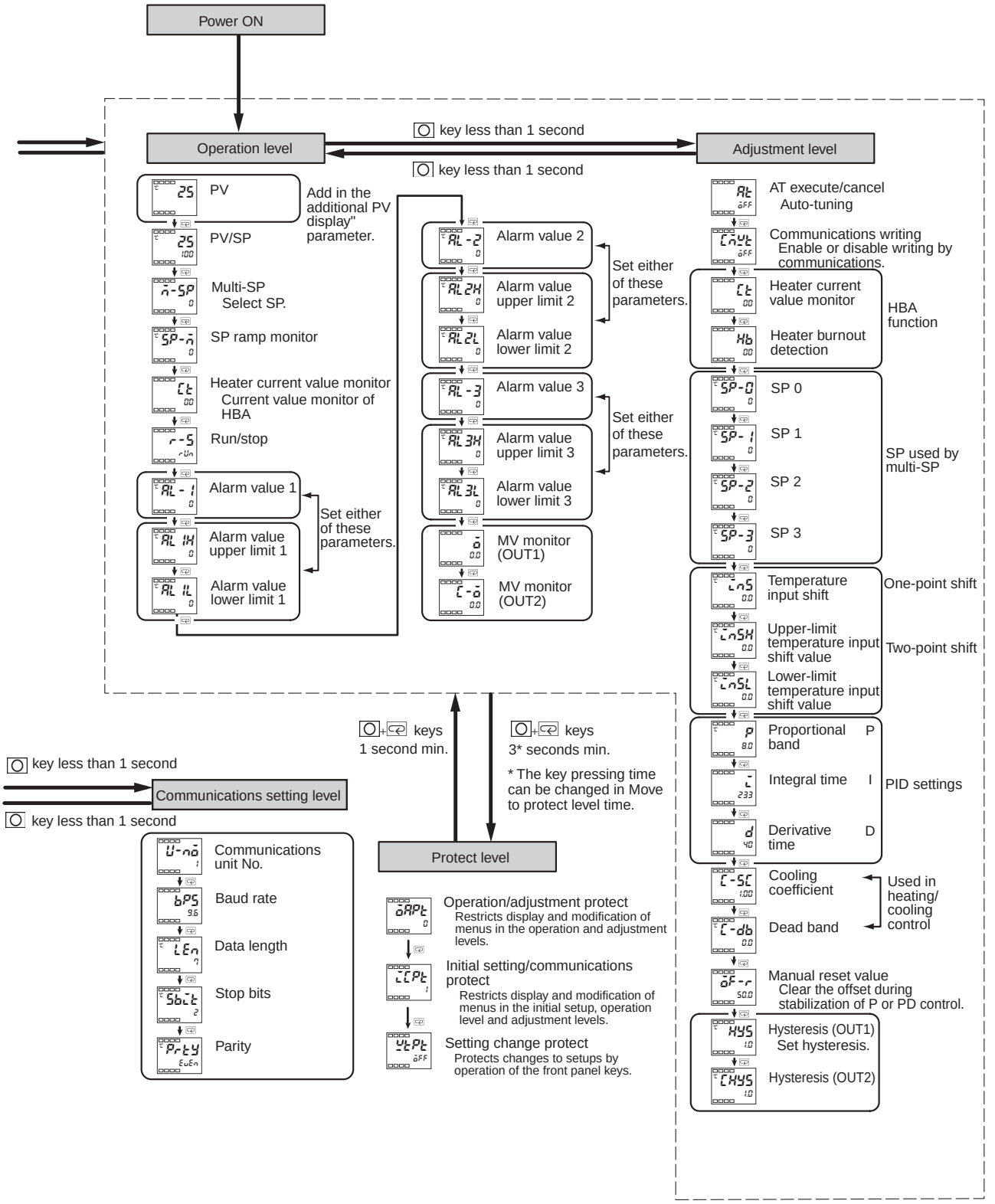
When switching from the operation level to the initial setting level, control stops.



Parameter Flow

- If you press the mode key at the last parameter in each level, you return to the top parameter in that level.




Power ON
Operation level
key less than 1 second
Adjustment level
key less than 1 second
PV
Add in the additional PV display" parameter.
PV/SP
Multi-SP
Select SP.
SP ramp monitor
Heater current value monitor
Current value monitor of HBA
Run/stop
Alarm value 1
Alarm value upper limit 1
Alarm value lower limit 1
Set either of these parameters.
Alarm value 2
Alarm value upper limit 2
Alarm value lower limit 2
Set either of these parameters.
Alarm value 3
Alarm value upper limit 3
Alarm value lower limit 3
Set either of these parameters.
MV monitor (OUT1)
MV monitor (OUT2)
AT execute/cancel
Auto-tuning
Communications writing
Enable or disable writing by communications.
Heater current value monitor
Heater burnout detection
HBA function
SP 0
SP 1
SP 2
SP 3
SP used by multi-SP
Temperature input shift
One-point shift
Upper-limit temperature input shift value
Lower-limit temperature input shift value
Two-point shift
Proportional band
P
Integral time
I
Derivative time
D
PID settings
Cooling coefficient
Dead band
Used in heating/ cooling control
Manual reset value
Clear the offset during stabilization of P or PD control.
Hysteresis (OUT1)
Set hysteresis.
Hysteresis (OUT2)
keys
1 second min.
keys
3* seconds min.
* The key pressing time can be changed in Move to protect level time.
key less than 1 second
Communications setting level
key less than 1 second
Communications unit No.
Baud rate
Data length
Stop bits
Parity
Protect level
Operation/adjustment protect
Restricts display and modification of menus in the operation and adjustment levels.
Initial setting/communications protect
Restricts display and modification of menus in the initial setup, operation level and adjustment levels.
Setting change protect
Protects changes to setups by operation of the front panel keys.

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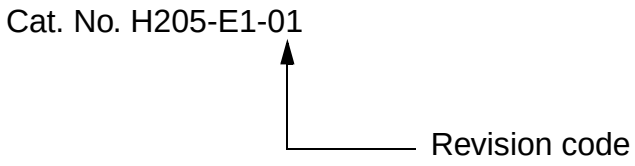
Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.



The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
1	September 2007	Original production

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Cat. No. H205-E1-01